



Antenna Datasheet

Product OC: YEMN701J1AH

Version: 1.0

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Status: Released

Product Name: 5G & GNSS 7in1 Screw Mount Combo Antenna

Key Features:

6 × 6 5G MIMO + GNSS L1 & L5

Optimized for 5G and 4G Networks

Screw Mount

SMA Male Connector

IP67 & IP69K

ASA Housing

Compatible with ECE-R118 cables under demand

Overview

YEMN701J1AH is a 5G & GNSS 7in1 combo antenna measuring Φ 162 mm $\times$ 56 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 9 cable lengths from 300–5,000 mm (Compatible with ECE-R118 cables), 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 IK09 rated enclosure. It is compatible with Quectel's RM520x Series modules.

YEMN701J1AH has 4 $\times$ 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. YEMN701J1AH can be used in harsh environments thanks to its robust UV resistant (UL 746c f1) enclosure.

Typical Applications Include:

- Next Generation OEM Automotive Connectivity
- Multimedia, Navigation and Telematics Systems
- V2V, V2X and Fleet Management Applications
- Real-time HD Video Streaming
- First Net Responder Routers

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.

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1 Specification

Test Condition: Free Space & On 300 mm × 400 mm metal plane

1.1. Electrical

Electrical Specifications		
Frequency Range	LMHs	600–960 MHz, 1400–6000 MHz
	MHs	1400–6000 MHz
	GNSS	1164–1189 MHz, 1559–1606 MHz
Radiation Pattern	LMHs & MHs	Omni-directional
	GNSS	Directional
Polarization	LMHs & MHs	Linear
	GNSS	RHCP
Impedance		50 Ω
Isolation		≤ -8 dB
Axial Ratio (GNSS)		< 3 dB

1.1.1. LMHs

SPEC	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
Max	FS	2.7	2.3	2.5	3.7	3.2	1.9	1.9	2.6	3.2	2.3	1.8
VSWR	MP	2.8	2.8	2.4	3.4	2.6	1.8	1.8	2.5	3.0	2.4	1.6
Max	FS	-6.8	-8.3	-7.2	-4.8	-5.7	-10.0	-10.3	-7.0	-5.6	-7.9	-10.9
Return Loss (dB)	MP	-6.4	-6.6	-7.8	-5.3	-7.0	-11.0	-10.7	-7.4	-6.0	-7.8	-12.7

AVG Eff. (%)	FS	32.7	44.5	43.0	31.8	43.1	57.6	59.3	56.4	47.4	56.1	55.9
	MP	14.7	20.8	19.7	28.2	40.7	57.7	57.3	53.6	46.1	56.7	56.7
AVG Gain (dB)	FS	-4.9	-3.5	-3.7	-5.0	-3.7	-2.4	-2.3	-2.5	-3.3	-2.5	-2.5
	MP	-8.4	-6.9	-7.1	-5.5	-3.9	-2.4	-2.4	-2.7	-3.4	-2.5	-2.5
Max Peak Gain (dBi)	FS	-0.5	0.2	1.0	0.9	2.0	3.9	4.1	3.8	3.4	4.9	4.1
	MP	0.9	4.5	4.3	3.1	5.6	6.6	6.7	6.5	8.2	5.5	7.0
VSWR	FS	≤ 3.7										
	MP	≤ 3.4										
Return Loss	FS	≤ -4.8 dB										
	MP	≤ -5.3 dB										
Peak Gain	FS	≤ 4.9 dBi										
	MP	≤ 8.2 dBi										

- LMHs: LMH antennas (LMH1, LMH2, LMH3, LMH4)
- MHs: MH antennas (MH1, MH2)
- FS: In Free Space
- MP: On 300 mm × 400 mm Metal Plane

1.1.2. MHs

Band	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
Max VSWR	FS	-	-	-	4.3	2.7	1.5	2.2	2.6	3.6	3.1	2.8
	MP	-	-	-	3.7	3.5	1.3	1.9	2.6	3.6	2.7	2.6
Max Return Loss (dB)	FS	-	-	-	-4.1	-6.8	-13.4	-8.6	-7.0	-5.0	-5.8	-6.4
	MP	-	-	-	-4.8	-5.1	-17.5	-10.3	-7.1	-4.9	-6.8	-7.0
AVG Eff. (%)	FS	-	-	-	34.7	51.1	66.3	60.5	56.0	50.3	58.6	56.1
	MP	-	-	-	26.7	40.9	60.0	55.8	54.7	44.3	56.0	54.5
AVG Gain (dB)	FS	-	-	-	-4.6	-2.9	-1.8	-2.2	-2.5	-3.0	-2.3	-2.5
	MP	-	-	-	-5.8	-4.1	-2.2	-2.5	-2.6	-3.6	-2.5	-2.6
Max Peak Gain (dBi)	FS	-	-	-	2.7	3.5	3.2	2.8	2.6	3.1	3.9	4.1
	MP	-	-	-	1.5	5.8	6.4	6.4	5.5	6.6	8.1	8.0
VSWR	FS	≤ 4.3										

	MP	≤ 3.7
Return Loss	FS	≤ -4.1 dB
	MP	≤ -4.8 dB
Peak Gain	FS	≤ 4.1 dBi
	MP	≤ 8.1 dBi

- LMHs: LMH antennas (LMH1, LMH2, LMH3, LMH4)
- MHs: MH antennas (MH1, MH2)
- FS: In Free Space
- MP: On 300 mm × 400 mm Metal Plane

1.1.3. GNSS

Band Frequency (MHz)	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
	1176	1207	1227	1248	1268	1561	1575	1602
VSWR	1.48	-	-	-	-	1.63	1.54	1.42
Return Loss (dB)	-14.2	-	-	-	-	-12.3	13.4	-15.2
Efficiency (%)	85	-	-	-	-	53	66	45.6
AVG Gain (dB)	-0.9	-	-	-	-	-3.37	-2.47	-4.03
Peak Gain (dBi)	4.67	-	-	-	-	2.85	3.82	2.25
Axial Ratio (dB)	2.44	-	-	-	-	1.2	0.79	0.77

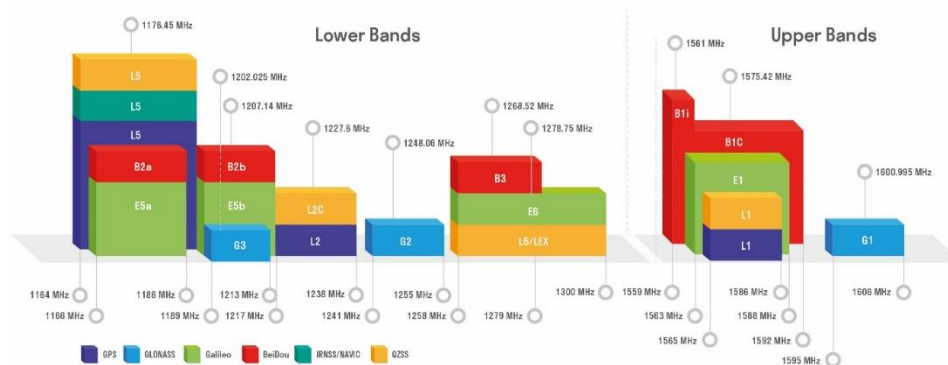
LNA Electrical	
LNA Gain	22 ±3 dB
Noise Figure	≤ 2.5 dB
Output VSWR	< 2.0
Filter Out-of-Band Attenuation	60 dB f0 ±100 MHz f0 (1164–1189 MHz, 1559–1606 MHz)
Working Voltage	3–5 V
Working Current	18.8 ±4 mA
Impedance	50 Ω

1.2. 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			√

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

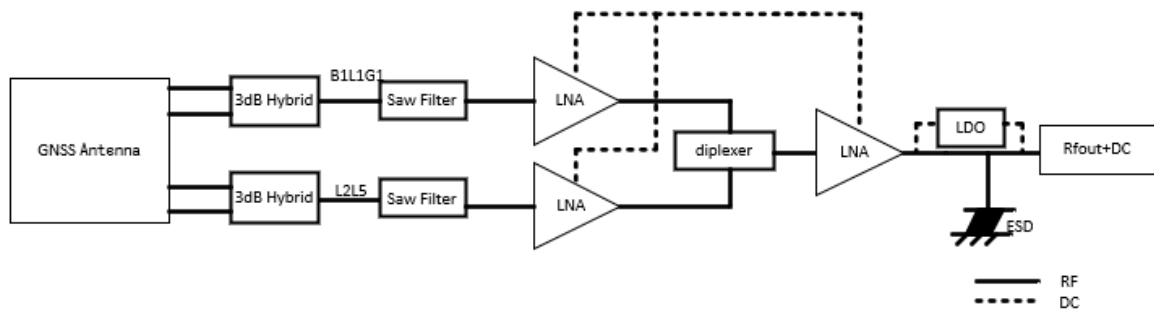
GNSS Bands and Constellations


1.3. Mechanical & Environmental

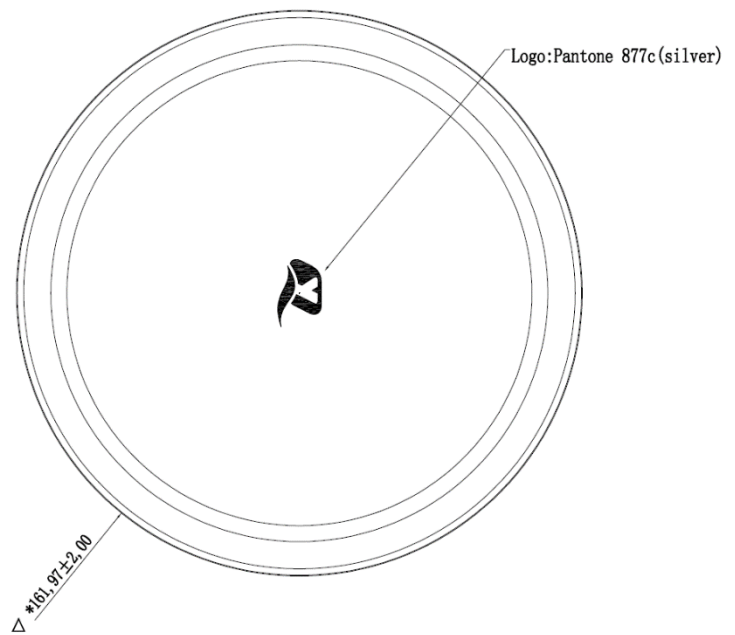
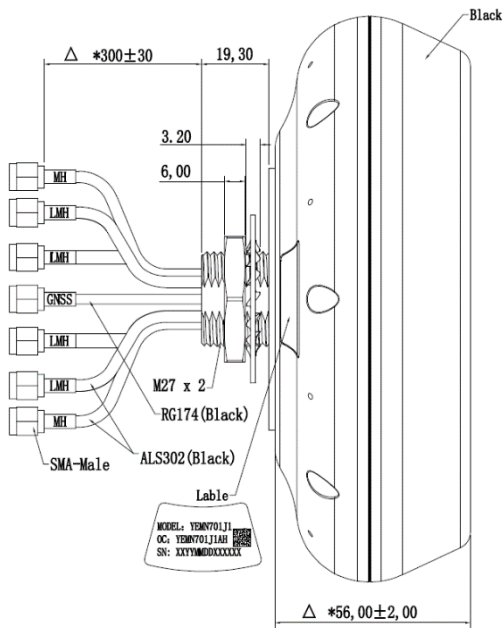
Mechanical		
Antenna Size		Φ 162 mm × 56 mm
Casing Material & Color		ASA & Black
Cable Type & Length	LMHs & MHs	ALS302 Black & 300 mm
	GNSS	RG174 Black & 300 mm
Connector Type		SMA Male (The current state of the SMA connector is not waterproof. If a waterproof connector is required, it can be customized.)
Weight		Typ. 530 g
Mounting Type		Screw Mount
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		IK09
RoHS & REACH Compliant		Yes
UV Resistant		UL 746c f1

- LMHs: LMH antennas (LMH1, LMH2, LMH3, LMH4)
- MHs: MH antennas (MH1, MH2,)
- FS: In Free Space
- MP: On 300 mm × 400 mm Metal Plane

1.4. Block Diagram (Active Antenna)



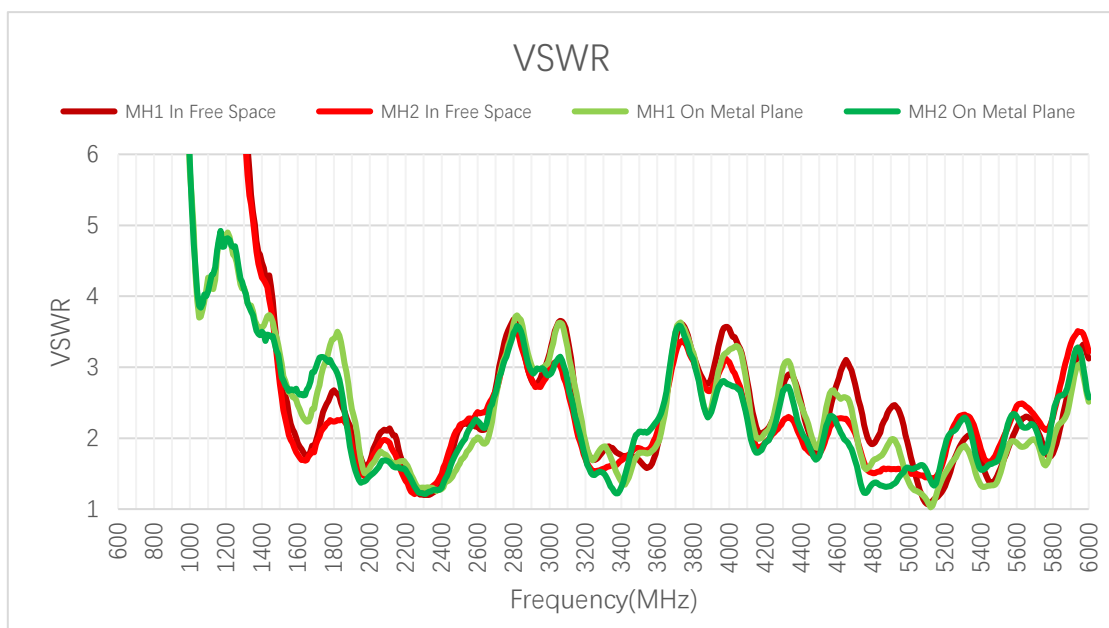
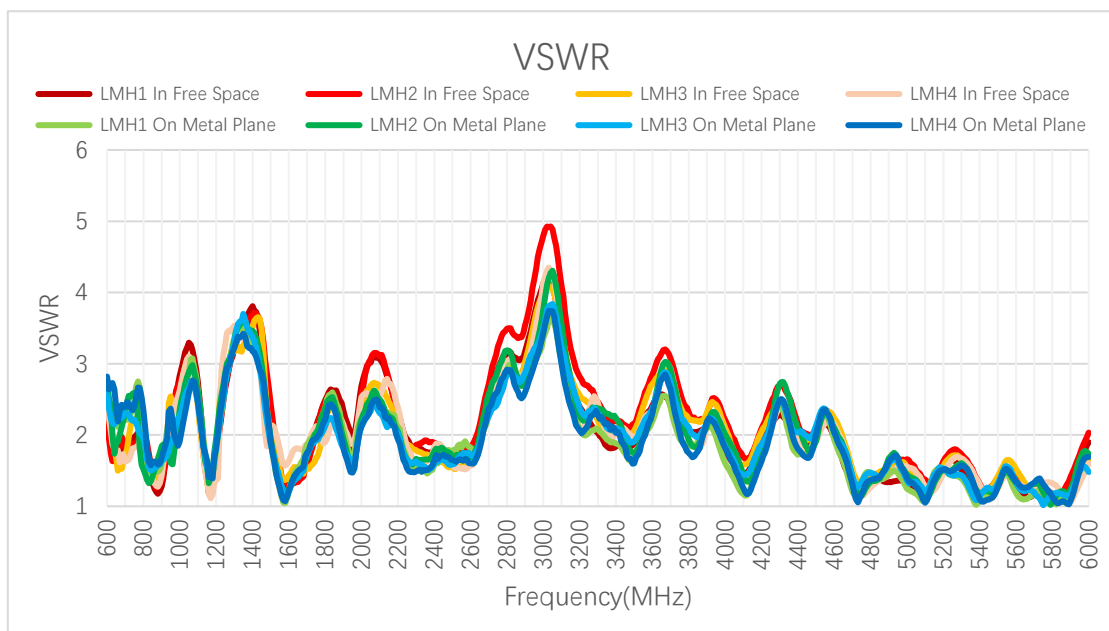
2 Drawing



3 Detailed Performance

3.1. S-Parameter Test

3.1.1. VSWR



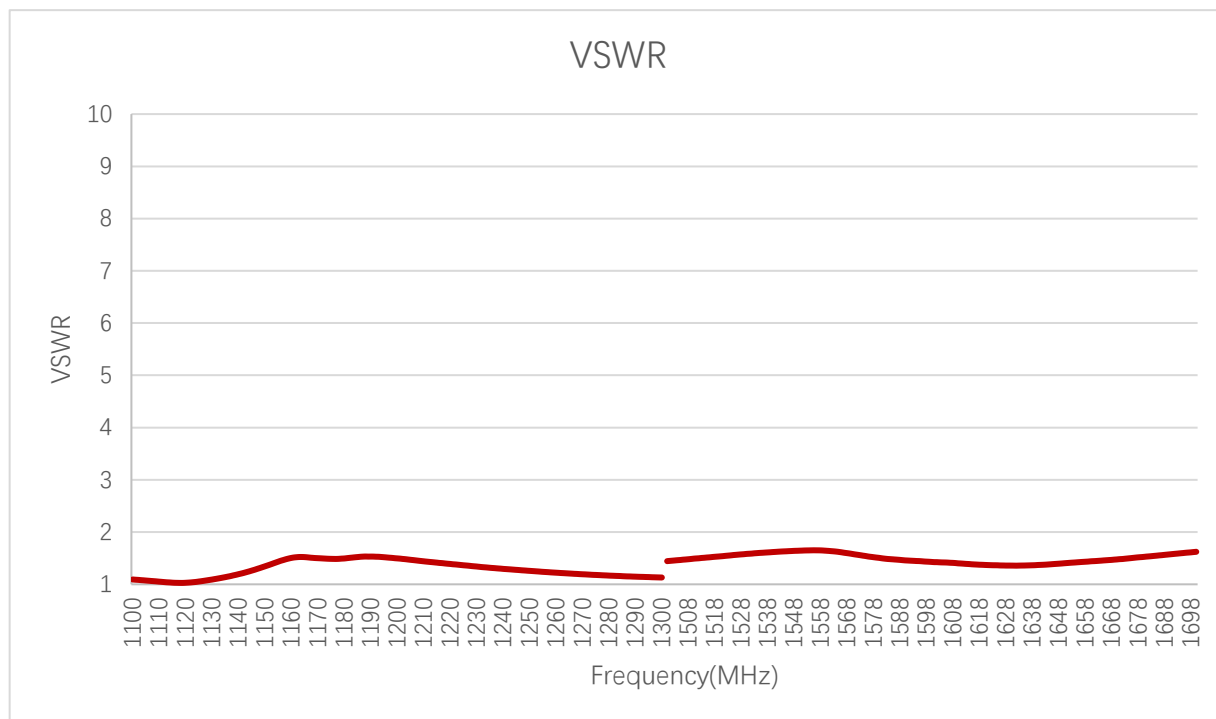
VSWR – LMH

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	2.4	1.8	1.8	1.6	1.3	2.3	3.5	1.8	2.1	2.5
	MP	2.6	2.4	2.2	1.5	1.6	2.1	3.0	1.9	2.0	2.3
LMH2	FS	2.3	1.6	1.8	1.7	1.4	2.3	3.6	1.7	1.9	2.2
	MP	2.7	2.0	2.5	1.3	1.8	1.6	3.2	1.8	2.0	2.2
LMH3	FS	2.7	2.0	1.8	1.4	1.5	2.4	3.6	1.5	1.6	2.2
	MP	2.6	2.2	2.3	1.5	1.6	1.9	2.9	1.8	1.9	1.9
LMH4	FS	2.6	1.9	1.6	1.6	1.4	2.2	3.0	1.9	2.1	2.3
	MP	2.8	2.7	2.5	1.6	1.7	2.2	2.9	1.8	1.9	2.1
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	2.0	2.8	1.8	1.8	1.8	2.4	1.3	1.3	1.4	1.9
	MP	1.6	2.3	1.5	1.7	1.8	2.2	1.2	1.2	1.3	1.7
LMH2	FS	1.8	2.9	1.9	1.8	1.8	2.8	1.5	1.7	1.4	2.0
	MP	1.5	2.3	1.7	1.8	1.7	2.3	1.4	1.4	1.3	1.7
LMH3	FS	1.6	2.5	1.7	1.6	1.7	2.7	1.5	1.6	1.4	1.6
	MP	1.6	2.1	1.6	1.7	1.7	2.4	1.4	1.4	1.3	1.5
LMH4	FS	1.9	2.8	1.6	1.8	1.6	2.3	1.5	1.6	1.2	1.6
	MP	1.5	2.2	1.5	1.7	1.6	2.3	1.3	1.4	1.3	1.7

VSWR – MH

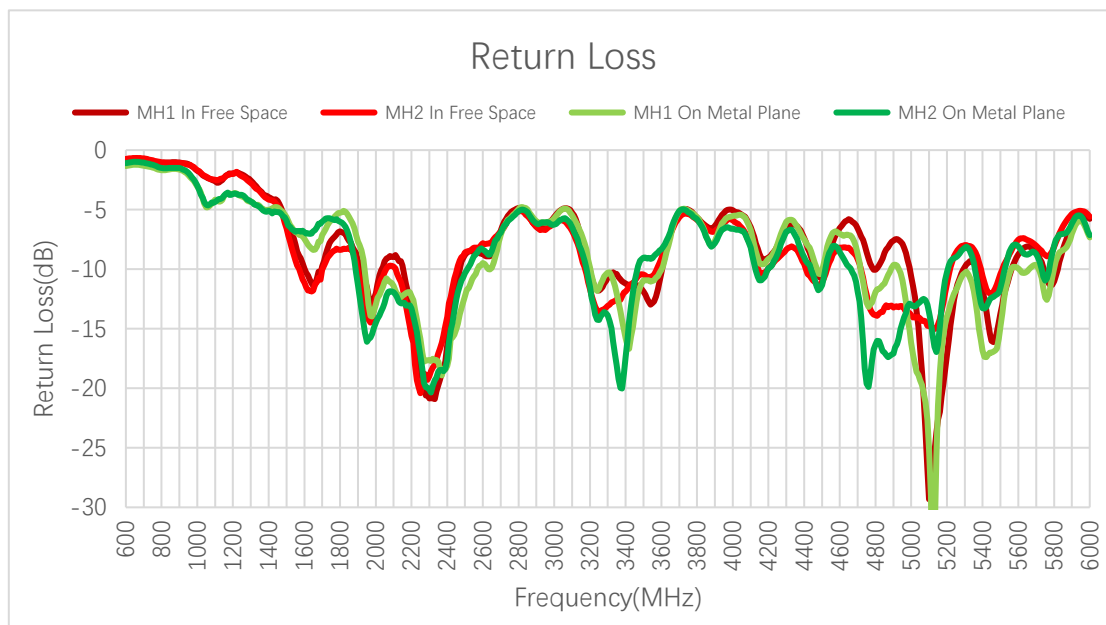
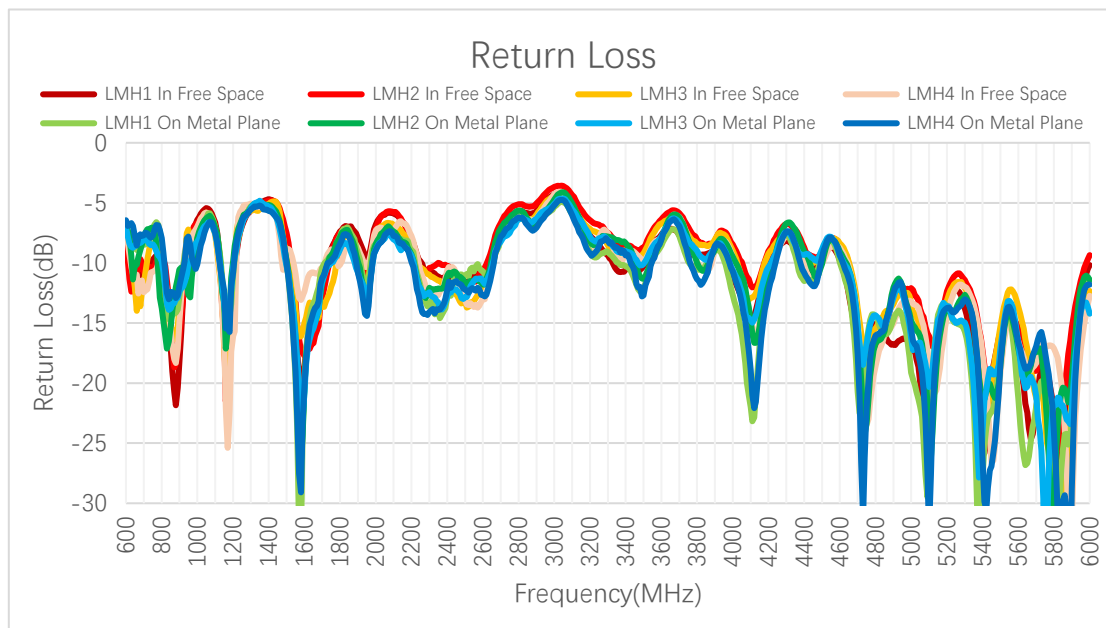
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	4.3	2.0	2.4	2.2
	MP	-	-	-	-	-	-	3.7	2.7	3.0	2.8
MH2	FS	-	-	-	-	-	-	4.0	2.0	2.1	2.1
	MP	-	-	-	-	-	-	3.5	3.1	3.1	2.0
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	1.7	2.0	1.2	1.7	2.2	1.9	2.8	1.8	1.5	3.1

	MP	1.7	1.6	1.3	1.4	2.0	1.9	2.2	1.4	1.4	2.5
MH2	FS	1.5	1.8	1.3	1.9	2.4	2.1	2.1	1.5	1.9	3.2
	MP	1.4	1.6	1.3	1.6	2.2	2.2	1.7	1.6	1.7	2.6


VSWR – GNSS

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
VSWR	1.48	-	-	-	-	1.63	1.54	1.42

3.1.2. Return Loss



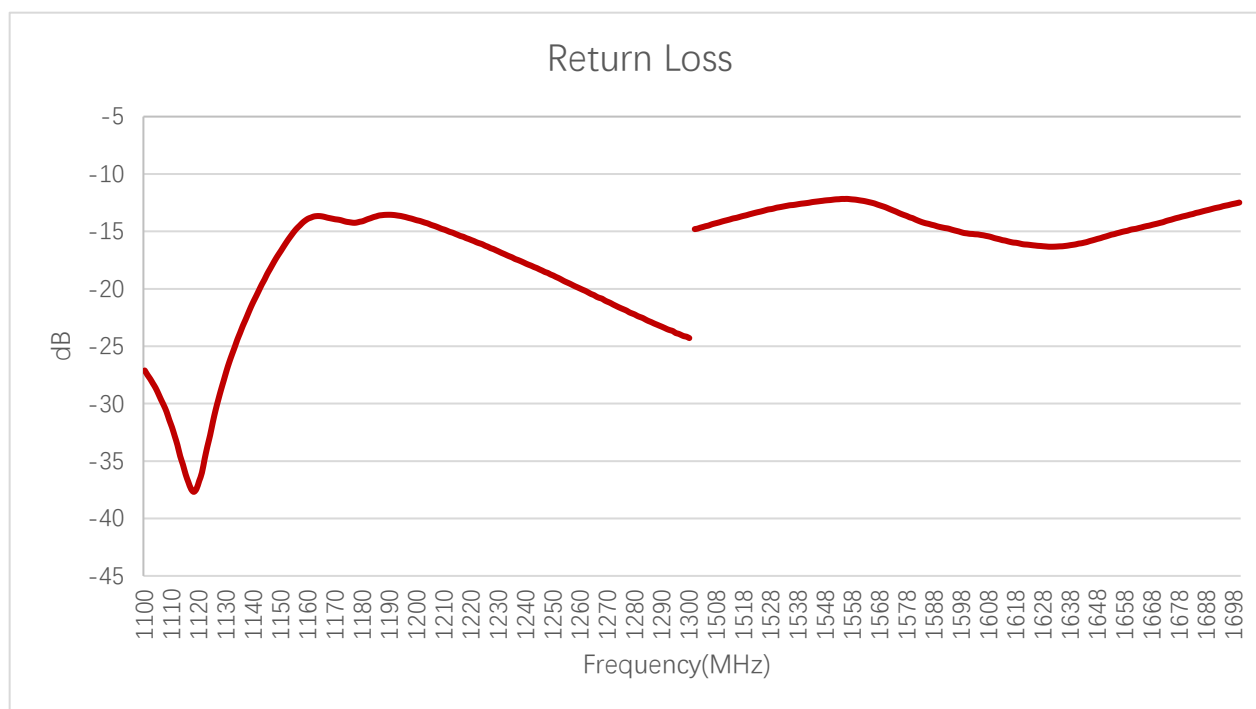
Return Loss (dB) – LMH

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	-7.6	-11.0	-11.2	-13.2	-18.3	-8.2	-5.1	-10.7	-9.3	-7.4
	MP	-7.0	-7.6	-8.5	-13.7	-12.8	-8.8	-6.0	-10.1	-9.5	-8.0
LMH2	FS	-8.0	-12.4	-11.0	-11.4	-16.3	-7.9	-4.9	-12.2	-9.9	-8.5
	MP	-6.7	-9.4	-7.5	-17.1	-10.6	-12.9	-5.7	-11.0	-9.6	-8.6

LMH3	FS	-6.8	-9.8	-10.8	-15.3	-13.7	-7.8	-4.9	-13.7	-12.5	-8.7
	MP	-7.0	-8.7	-8.1	-13.4	-12.4	-9.9	-6.2	-11.1	-10.2	-9.9
LMH4	FS	-7.2	-10.3	-12.3	-12.3	-14.9	-8.5	-6.0	-10.2	-9.0	-8.3
	MP	-6.4	-6.7	-7.5	-12.5	-11.9	-8.5	-6.2	-11.0	-9.9	-9.2
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	-9.8	-6.4	-11.1	-11.3	-10.8	-7.6	-17.7	-17.3	-15.8	-10.2
	MP	-12.5	-8.0	-14.0	-11.5	-10.7	-8.5	-20.7	-19.1	-17.6	-11.6
LMH2	FS	-10.9	-6.3	-10.0	-11.2	-10.7	-6.4	-14.3	-12.1	-15.9	-9.4
	MP	-14.1	-8.2	-12.1	-10.8	-11.8	-8.0	-15.3	-14.8	-18.5	-11.4
LMH3	FS	-12.2	-7.3	-11.5	-12.6	-12.0	-6.7	-13.8	-13.3	-15.3	-12.3
	MP	-13.0	-9.0	-13.3	-12.2	-11.5	-7.8	-15.3	-16.3	-17.1	-14.2
LMH4	FS	-10.3	-6.5	-12.7	-11.0	-13.0	-8.0	-14.7	-13.2	-19.1	-12.7
	MP	-14.4	-8.4	-13.9	-11.5	-12.7	-8.0	-17.6	-15.5	-18.3	-11.8

Return Loss (dB) – MH

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	-9.3	-7.8	-8.4	-8.4
	MP	-	-	-	-	-	-	-6.9	-6.0	-6.6	-6.6
MH2	FS	-	-	-	-	-	-	-9.7	-8.8	-8.9	-8.9
	MP	-	-	-	-	-	-	-5.9	-5.7	-9.3	-9.3
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	-9.3	-19.7	-11.6	-8.7	-10.3	-6.6	-10.6	-13.7	-5.8	-5.8
	MP	-12.4	-17.8	-15.0	-9.5	-10.0	-8.7	-16.2	-14.8	-7.3	-7.3
MH2	FS	-11.1	-17.1	-10.3	-7.8	-9.1	-9.2	-13.8	-10.4	-5.6	-5.6
	MP	-12.9	-18.6	-12.6	-8.3	-8.3	-11.9	-13.0	-11.6	-7.1	-7.1



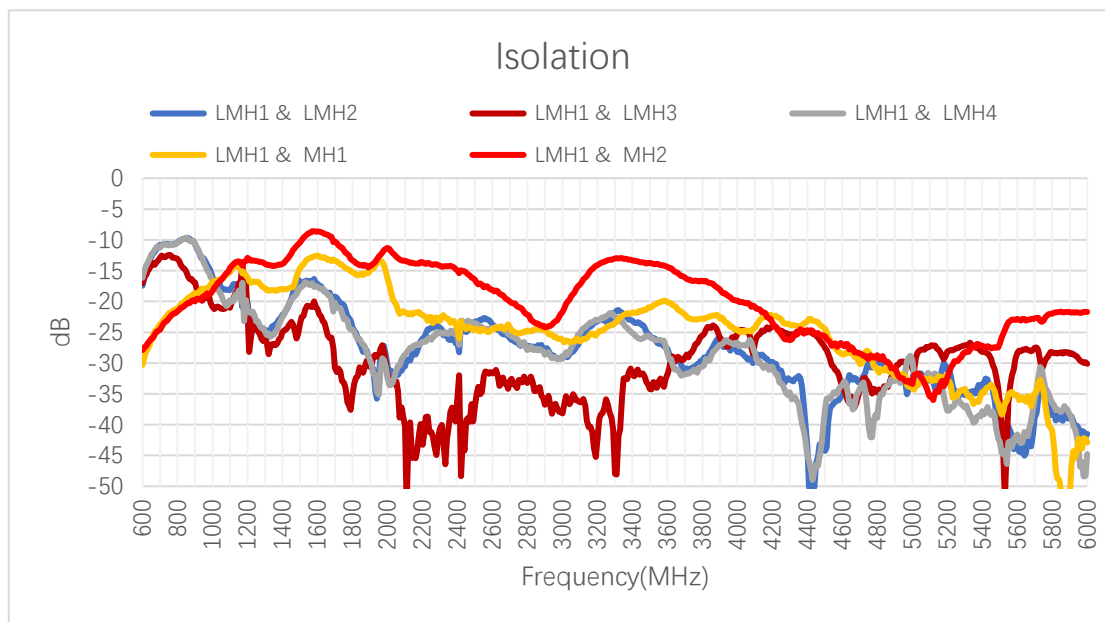
Return Loss (dB) – GNSS

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Return Loss (dB)	-14.2	-	-	-	-	-12.3	-13.4	-15.2

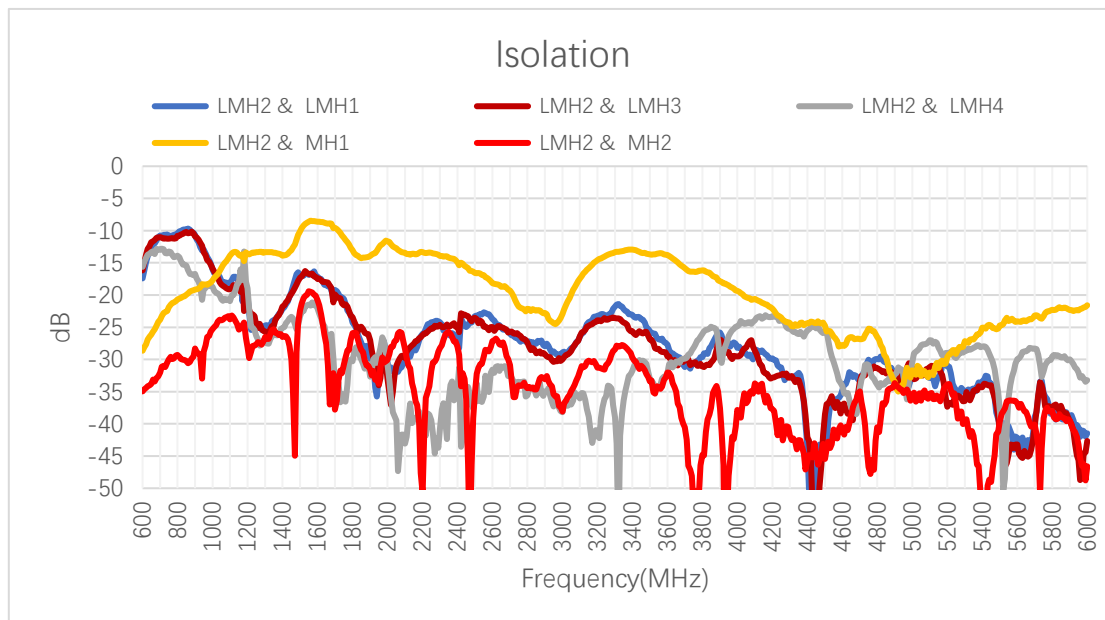
3.1.3. Isolation

3.1.3.1. Test Status: In Free Space

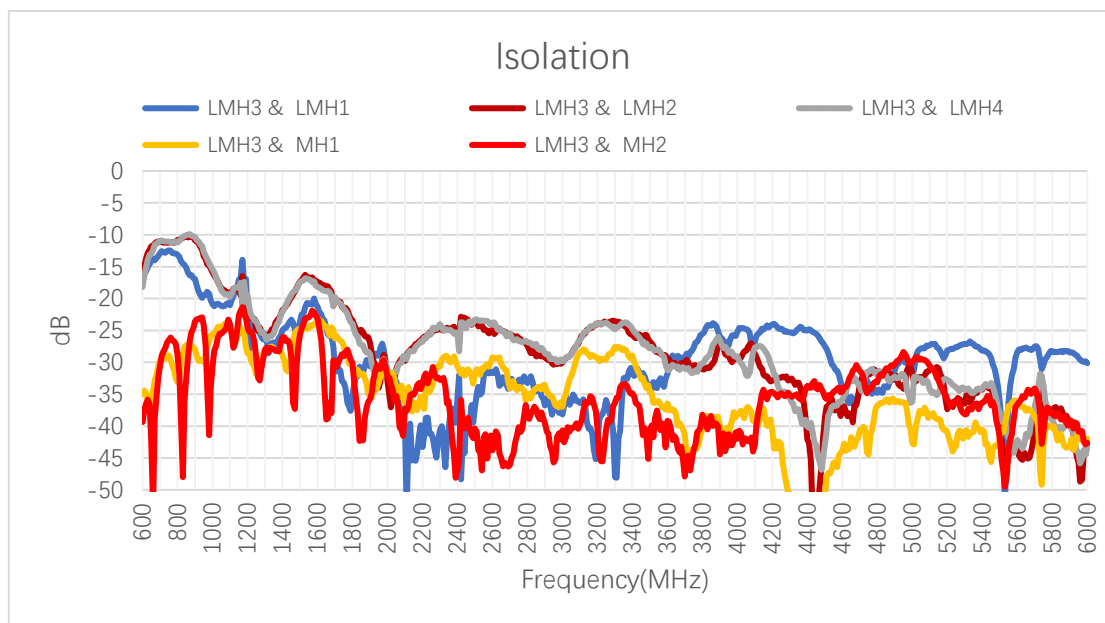
3.1.3.1.1. LMH1



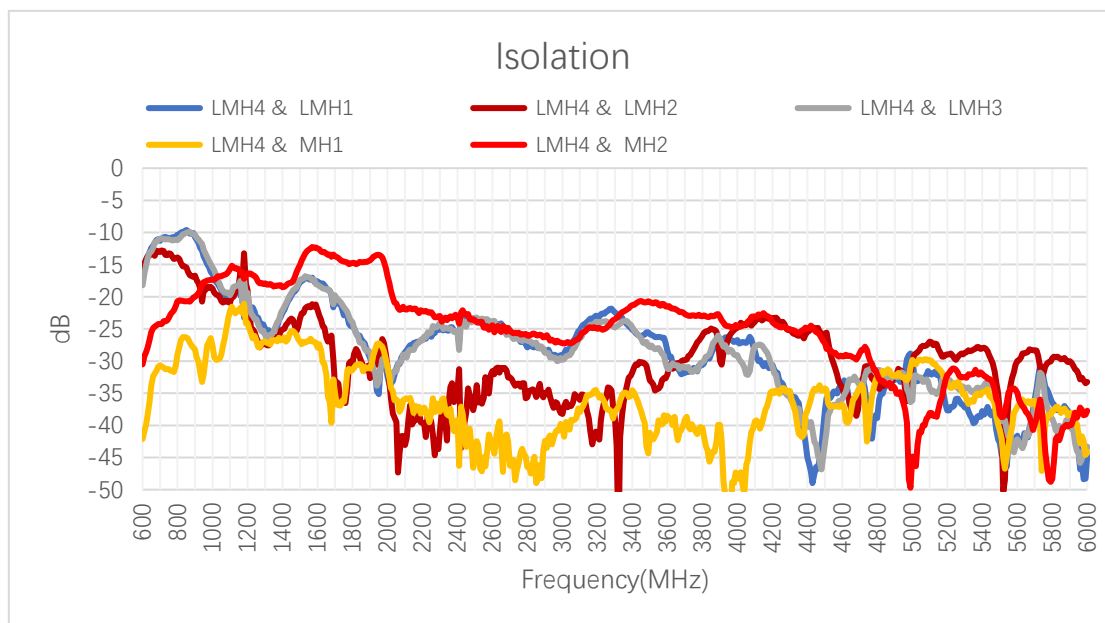
3.1.3.1.2. LMH2



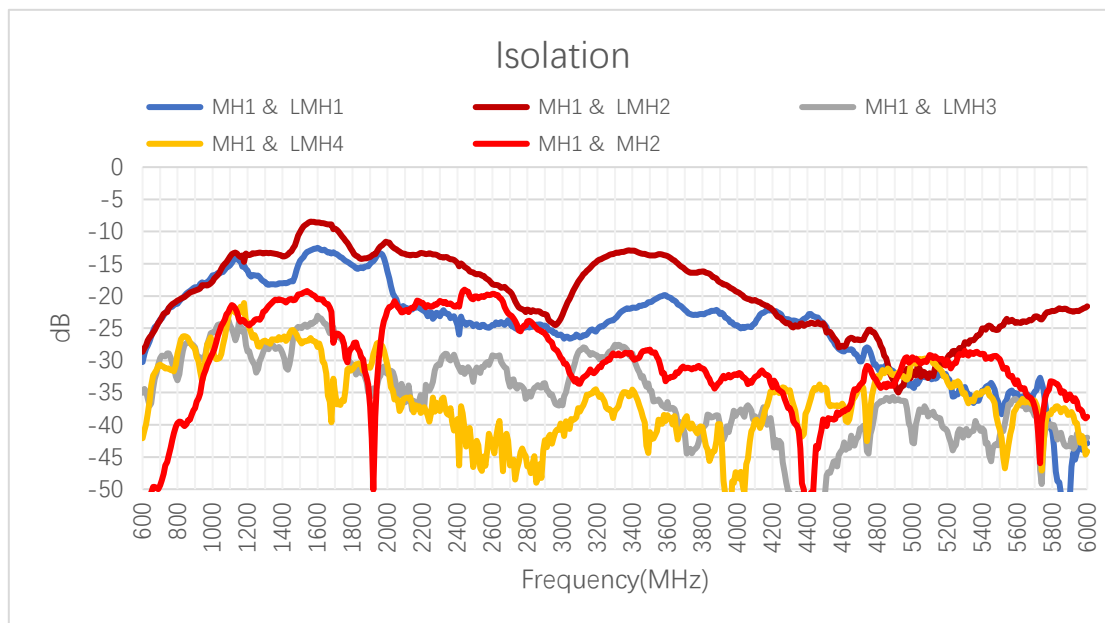
3.1.3.1.3. LMH3



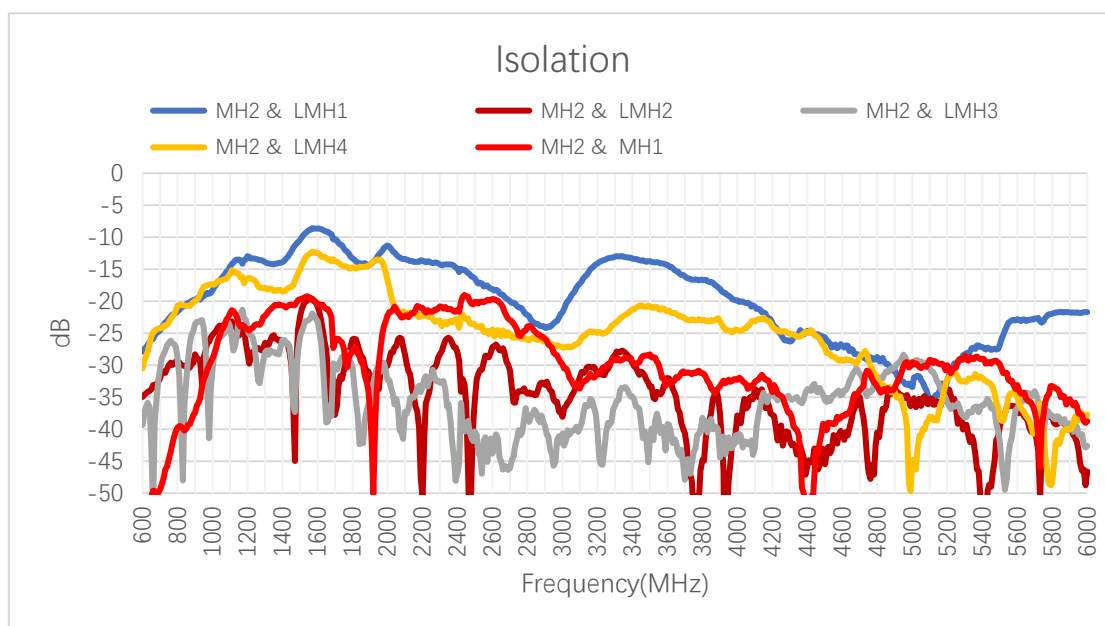
3.1.3.1.4. LMH4



3.1.3.1.5. MH1

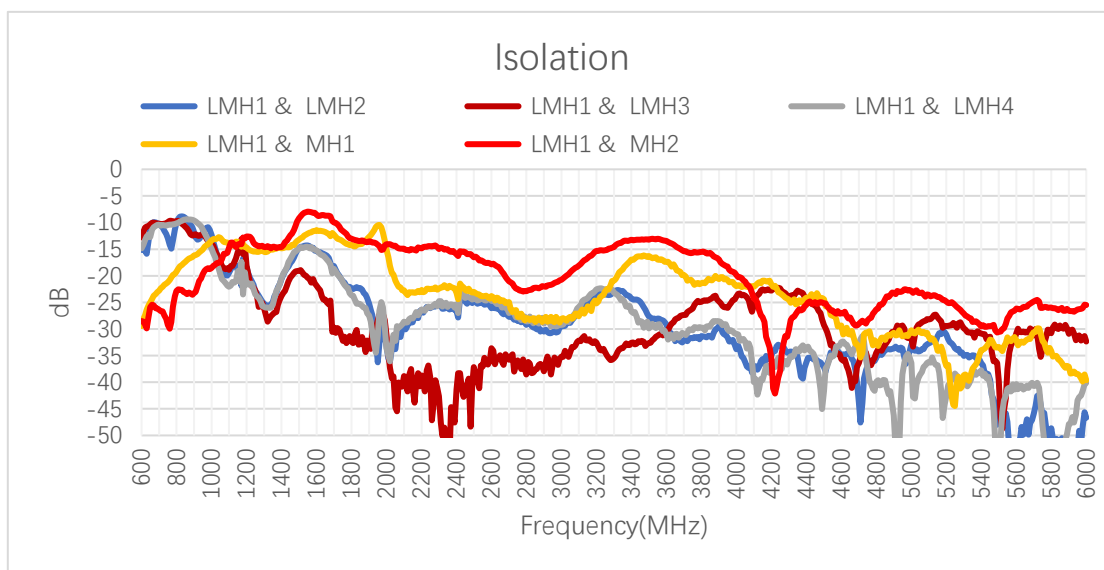


3.1.3.1.6. MH2

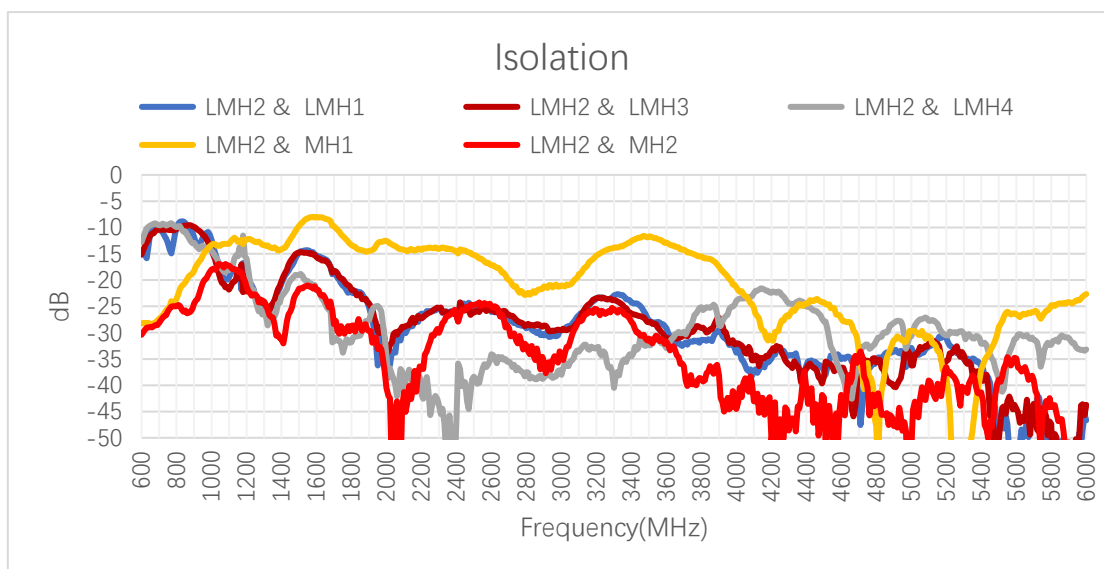


3.1.3.2. Test Status: On 300 mm × 400 mm Metal Plane

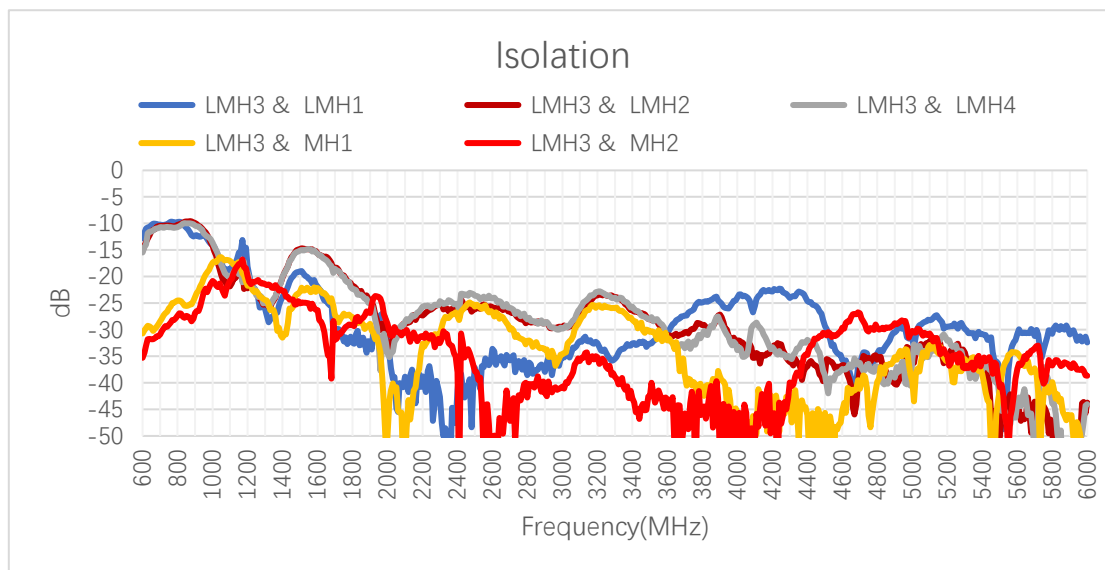
3.1.3.2.1. LMH1



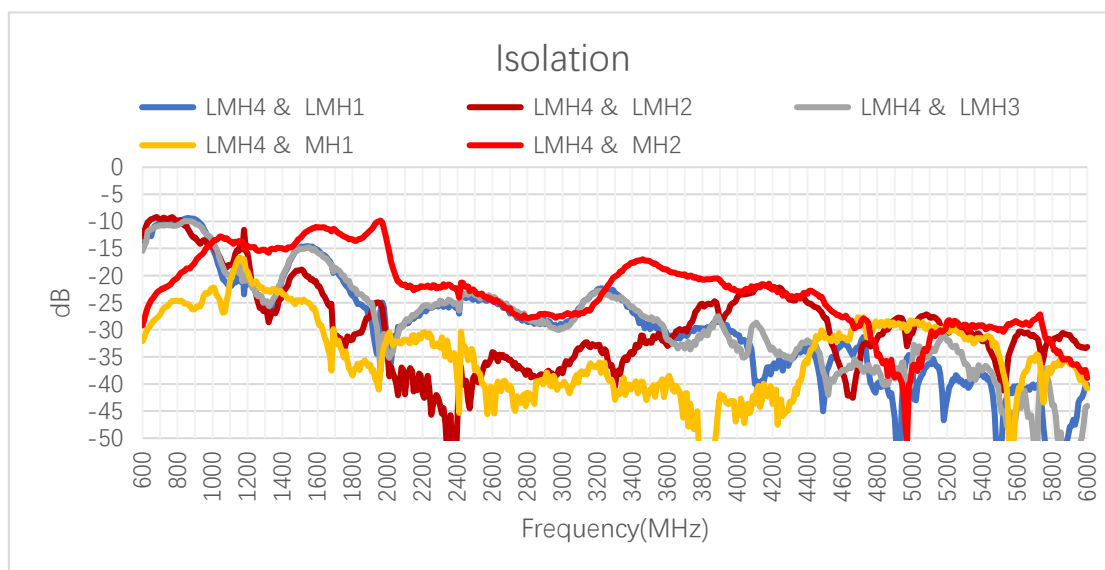
3.1.3.2.2. LMH2



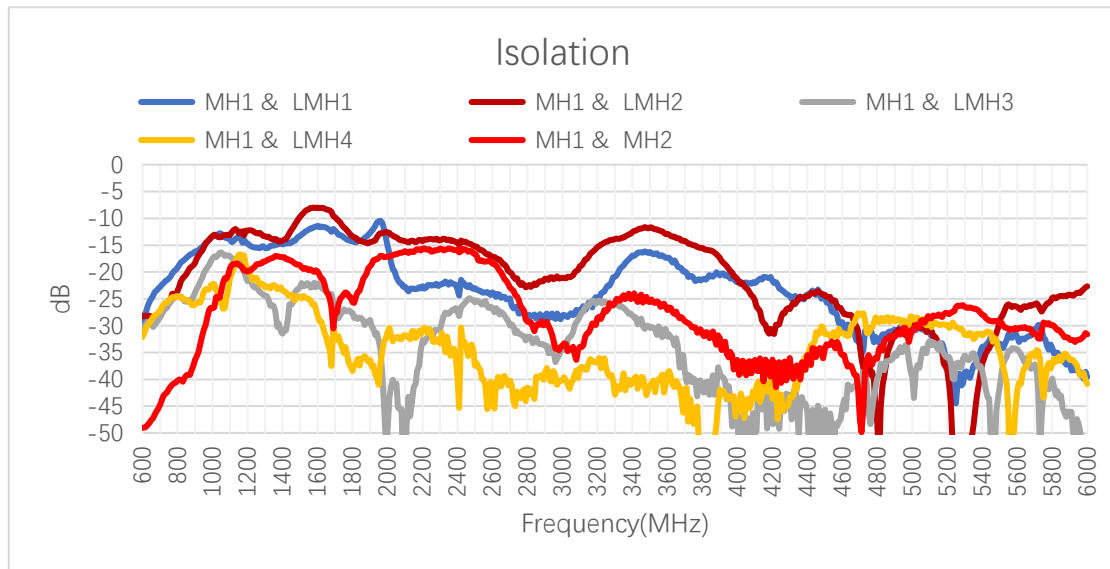
3.1.3.2.3. LMH3



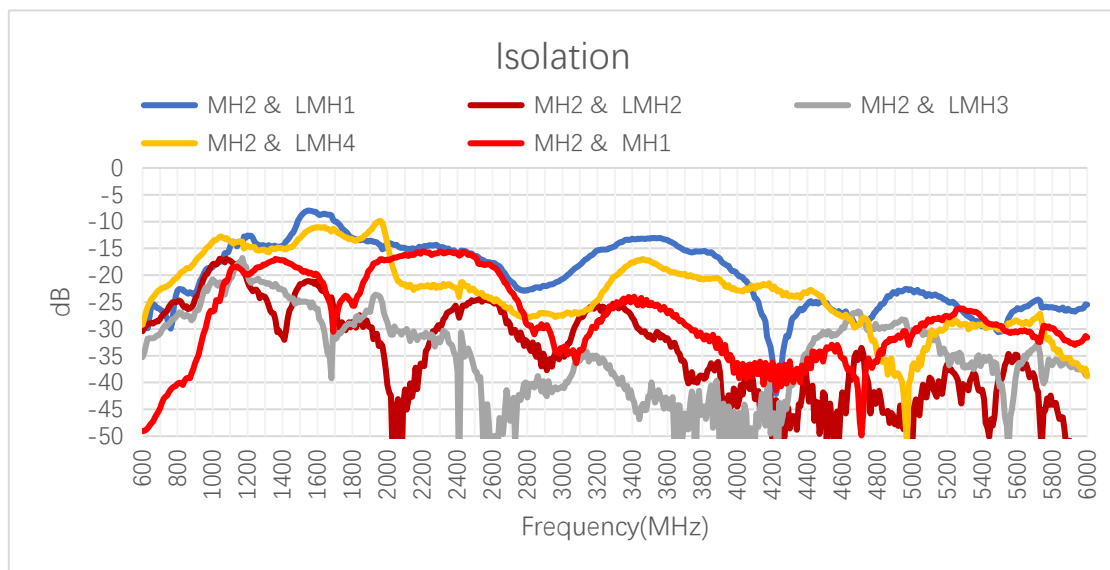
3.1.3.2.4. LMH4



3.1.3.2.5. MH1



3.1.3.2.6. MH2



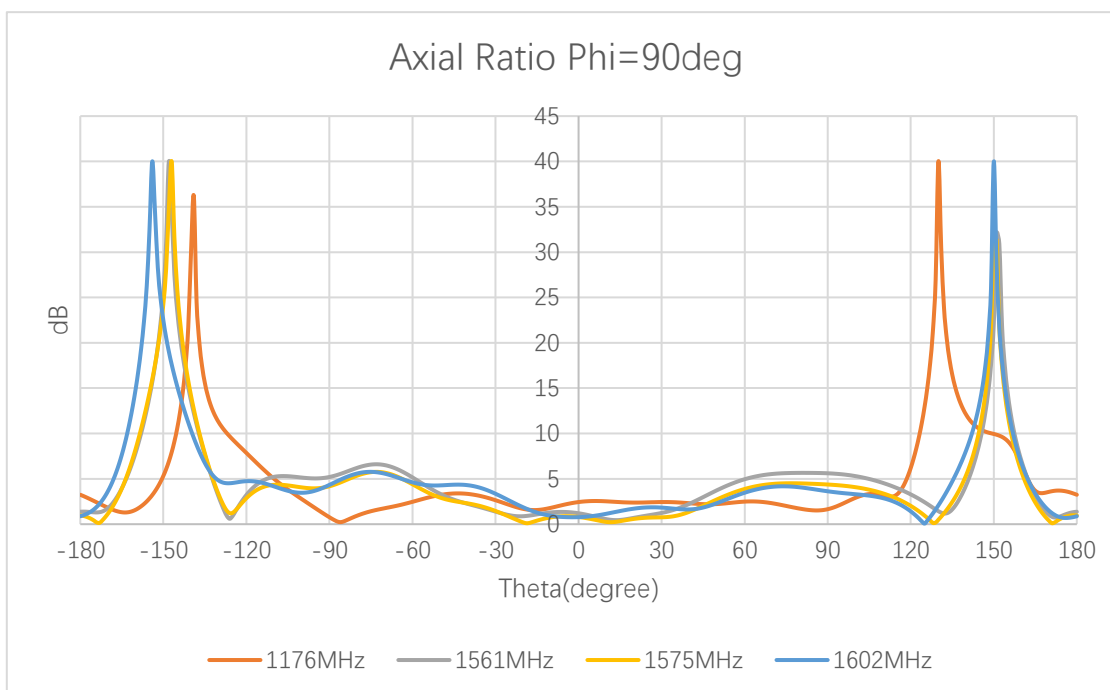
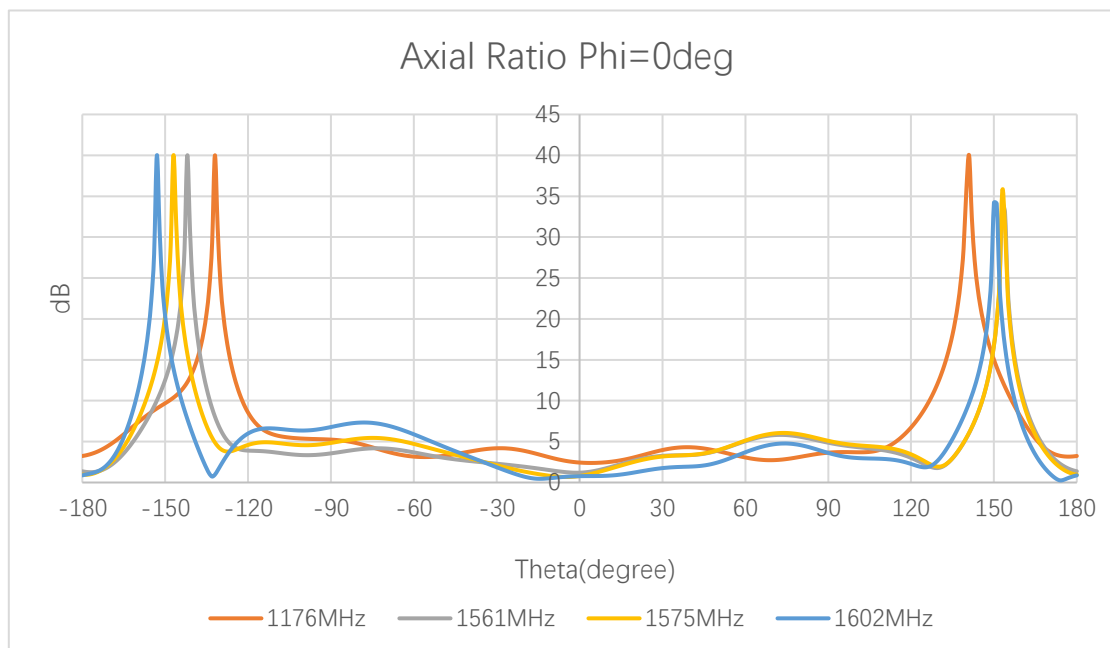
Max Isolation (dB)

	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	-10.8	-10.1	-9.6	-9.7	-10.3	-14.2	-14.9	-16.4	-13.0	-22.8	-21.7

	MP	-9.9	-9.3	-8.8	-8.4	-10.0	-14.7	-15.4	-16.4	-13.1	-22.6	-24.0
LMH2	FS	-10.8	-10.1	-9.7	-9.2	-9.6	-13.9	-14.9	-16.6	-12.9	-23.9	-21.9
	MP	-9.2	-9.2	-8.8	-9.0	-9.8	-13.8	-14.1	-15.3	-11.6	-23.6	-24.4
LMH3	FS	-11.0	-10.8	-9.9	-9.4	-10.2	-14.4	-15.5	-16.4	-13.2	-22.8	-21.9
	MP	-10.0	-9.7	-9.6	-9.1	-9.7	-14.4	-14.9	-15.9	-12.5	-22.7	-23.3
LMH4	FS	-11.0	-10.3	-9.6	-10.0	-10.6	-13.8	-15.1	-15.9	-13.0	-23.9	-22.4
	MP	-9.2	-9.2	-9.4	-8.8	-9.7	-13.8	-14.1	-14.8	-12.3	-22.5	-23.2
MH1	FS	-23.7	-20.5	-17.9	-9.2	-9.6	-13.9	-14.9	-16.6	-12.9	-22.8	-21.9
	MP	-22.8	-18.6	-14.5	-9.0	-9.8	-13.8	-14.1	-15.3	-11.6	-23.3	-24.4
MH2	FS	-24.2	-20.5	-17.6	-9.7	-10.3	-14.2	-14.9	-16.4	-13.0	-24.5	-21.7
	MP	-22.7	-19.9	-15.1	-8.4	-9.8	-14.7	-15.4	-16.4	-13.1	-22.6	-24.0

- FS: In Free Space
- MP: On 300 mm × 400 mm Metal Plane

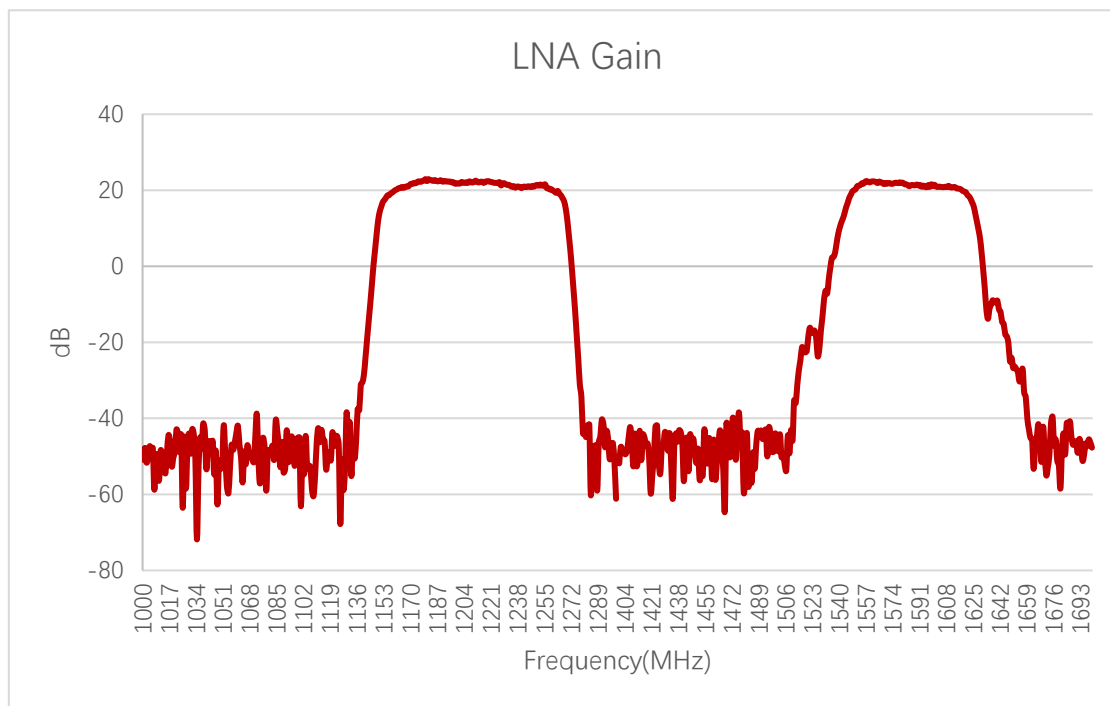
3.1.4. GNSS Axial Ratio



Axial Ratio (dB)

Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
Axial Ratio (dB)	Phi = 0 (deg) Theta = 0 (deg)	2.44	-	-	-	-	1.2	0.79	0.77
	Phi = 90 (deg) Theta = 0 (deg)	2.44	-	-	-	-	1.2	0.79	0.77

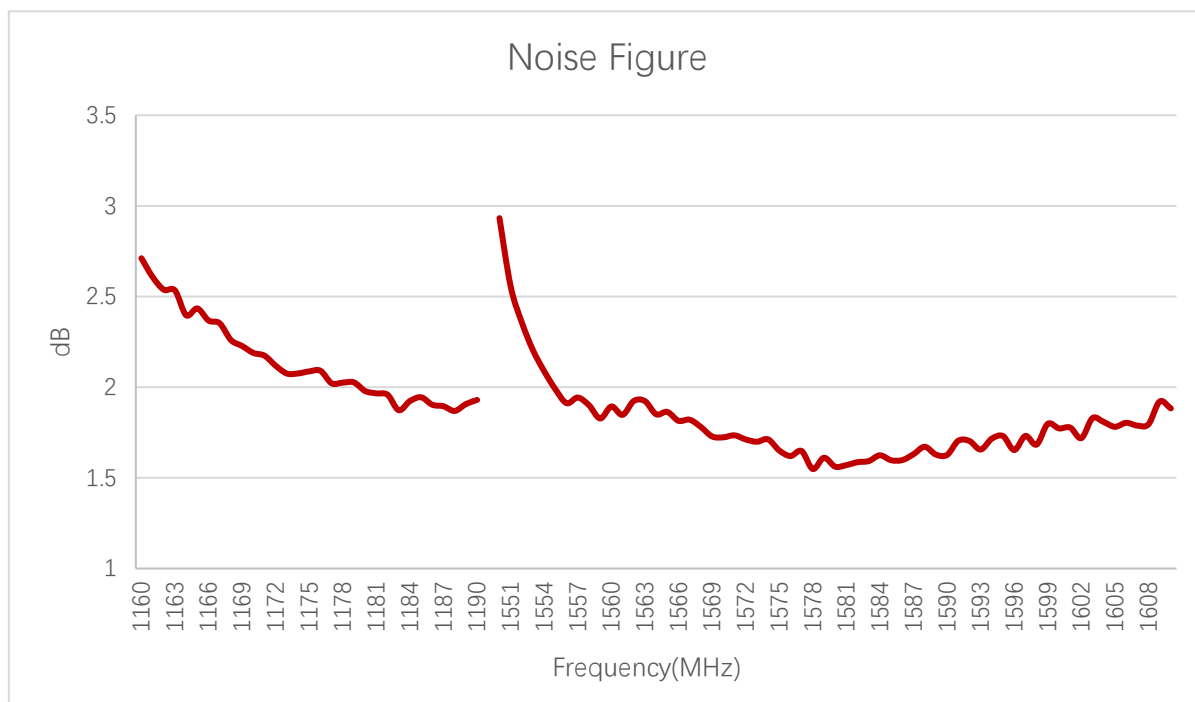
3.1.5. GNSS LNA Gain



LNA Gain (dB)

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
LNA Gain (dB)	22.2	-	-	-	-	22.3	21.9	20.8

3.1.6. GNSS Noise Figure

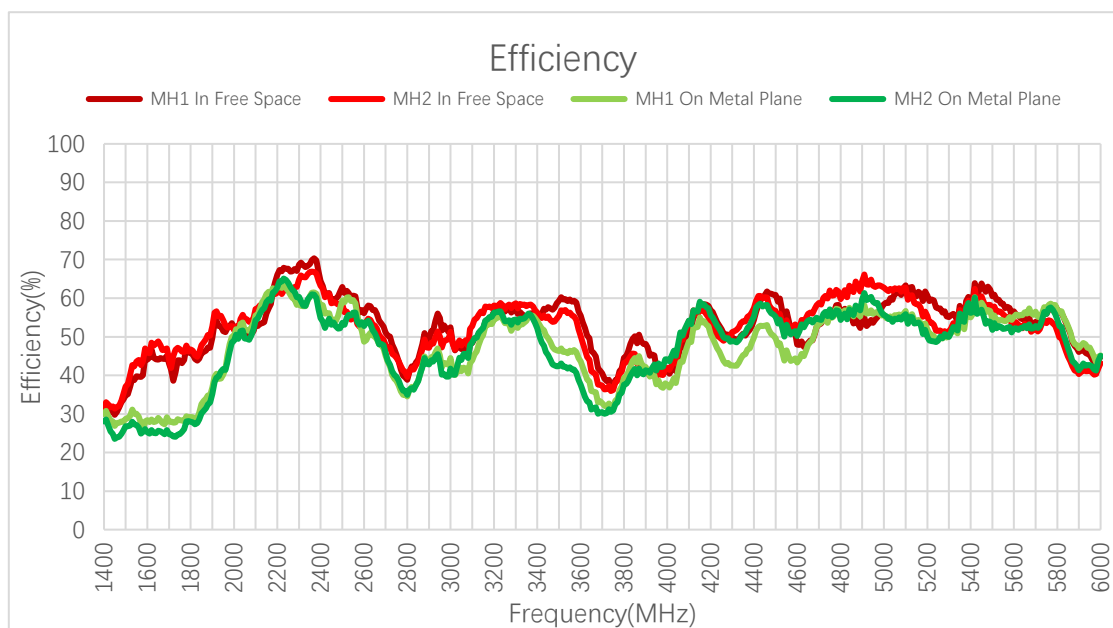
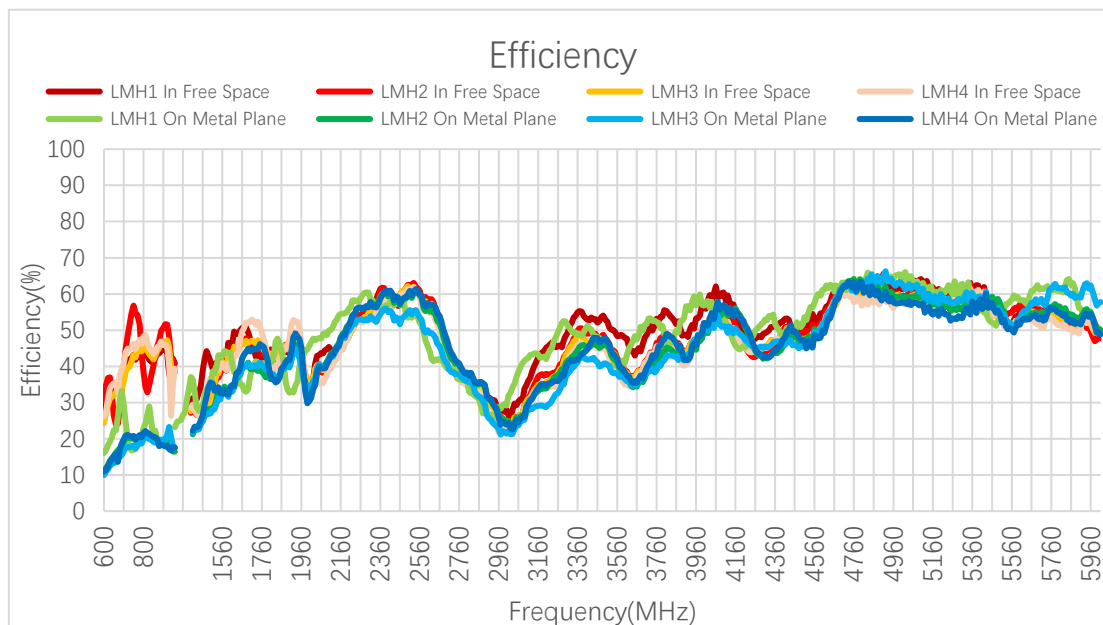


Noise Figure (dB)

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Noise Figure (dB)	2.09	-	-	-	-	1.84	1.65	1.71

3.2. Radiation Performance Test

3.2.1. Efficiency



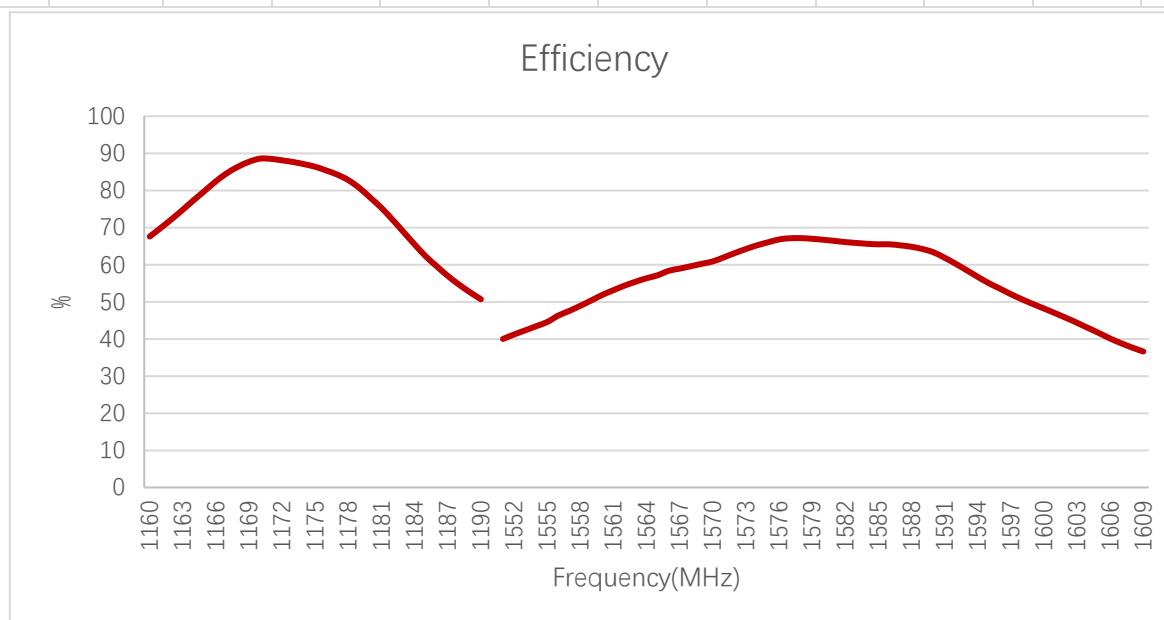
Efficiency (%) – LMH

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	28.6	34.5	40.6	41.9	44.7	40.7	32.6	46.7	43.6	45.3
	MP	11.1	17.3	18.2	16.7	24.2	19.8	26.5	37.7	35.0	41.8
LMH2	FS	30.7	37.0	44.8	34.8	50.7	38.5	26.6	46.9	47.0	46.0
	MP	10.9	13.9	20.2	20.1	18.8	16.4	24.1	39.4	39.4	41.1
LMH3	FS	24.4	31.2	38.4	43.3	46.4	38.8	27.9	47.1	47.2	45.8
	MP	10.0	12.6	17.5	19.9	19.8	17.6	24.1	40.2	41.0	40.2
LMH4	FS	26.2	34.0	43.7	45.0	45.9	39.4	26.3	52.9	52.3	45.3
	MP	11.0	13.7	20.9	21.4	18.2	17.5	25.1	44.9	46.1	41.8
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	43.7	43.5	60.1	56.7	55.7	47.9	62.6	61.4	55.2	50.6
	MP	41.0	47.7	59.6	55.1	53.4	45.7	62.4	63.9	54.8	55.0
LMH2	FS	45.4	43.4	59.1	57.5	58.4	38.8	61.6	59.2	54.3	47.6
	MP	41.8	46.2	59.0	56.8	55.2	36.3	62.3	58.9	55.2	50.1
LMH3	FS	44.8	43.7	57.7	57.8	57.1	38.5	60.6	58.8	52.5	49.6
	MP	40.3	45.4	54.4	51.6	49.2	35.9	62.6	62.3	54.0	57.7
LMH4	FS	50.7	42.1	56.6	57.2	54.9	34.9	60.4	57.6	52.4	50.7
	MP	45.3	45.7	58.7	57.3	56.8	37.5	62.2	57.7	52.2	48.8

Efficiency (%) – MH

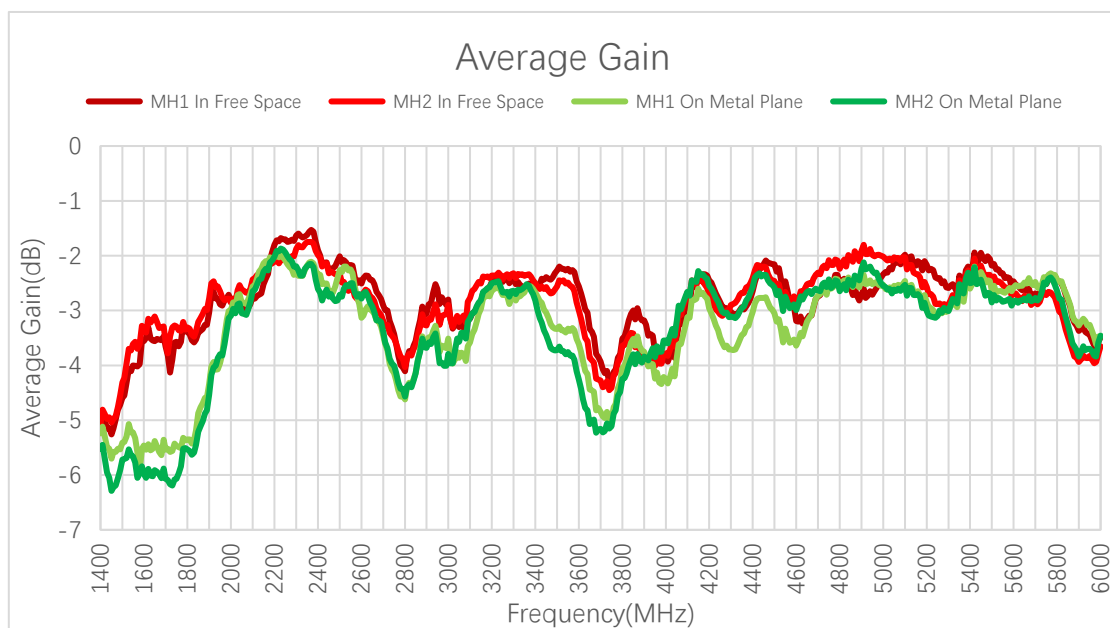
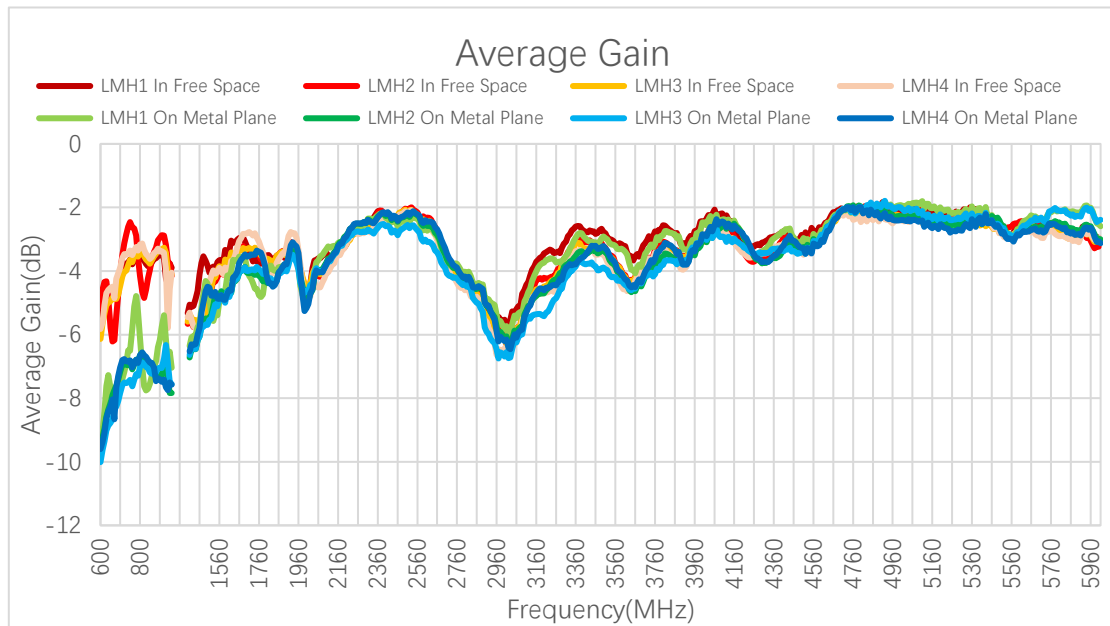
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	30.7	41.5	43.9	47.3
	MP	-	-	-	-	-	-	28.1	28.1	28.7	34.7
MH2	FS	-	-	-	-	-	-	32.0	41.9	47.1	50.4
	MP	-	-	-	-	-	-	24.9	24.6	24.6	32.5
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000

MH1	FS	51.4	53.8	68.9	59.3	56.1	55.4	53.1	58.4	60.5	44.8
	MP	40.2	59.7	60.6	54.0	48.7	43.6	53.3	55.8	54.6	45.1
MH2	FS	54.3	58.1	66.8	58.7	53.0	50.2	58.8	62.8	56.4	43.1
	MP	41.7	57.3	60.4	53.1	52.7	37.5	54.5	55.6	51.8	45.1


Efficiency (%) – GNSS

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Efficiency (%)	85	-	-	-	-	53	66	45.7

3.2.2. Average Gain



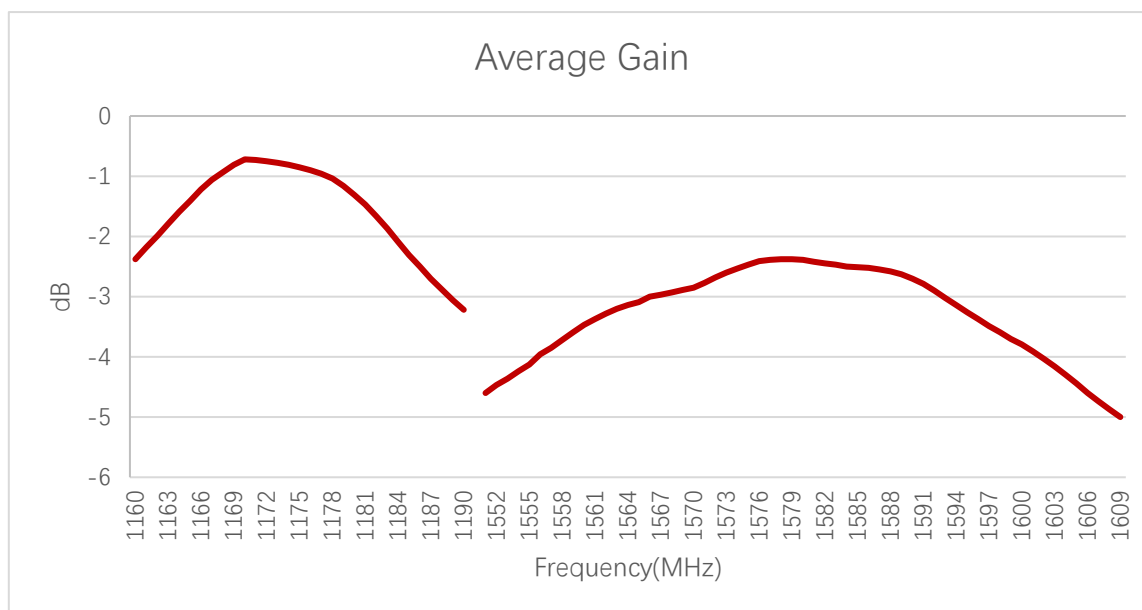
Average Gain (dB) – LMH

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	-5.4	-4.6	-3.9	-3.8	-3.5	-3.9	-4.9	-3.3	-3.6	-3.4
	MP	-9.6	-7.6	-7.4	-7.8	-6.2	-7.0	-5.8	-4.2	-4.6	-3.8
LMH2	FS	-5.1	-4.3	-3.5	-4.6	-3.0	-4.2	-5.8	-3.3	-3.3	-3.4

	MP	-9.6	-8.6	-6.9	-7.0	-7.3	-7.8	-6.2	-4.0	-4.0	-3.9
LMH3	FS	-6.1	-5.1	-4.2	-3.6	-3.3	-4.1	-5.5	-3.3	-3.3	-3.4
	MP	-10.0	-9.0	-7.6	-7.0	-7.0	-7.6	-6.2	-4.0	-3.9	-4.0
LMH4	FS	-5.8	-4.7	-3.6	-3.5	-3.4	-4.1	-5.8	-2.8	-2.8	-3.4
	MP	-9.6	-8.6	-6.8	-6.7	-7.4	-7.6	-6.0	-3.5	-3.4	-3.8
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	-3.6	-3.6	-2.2	-2.5	-2.5	-3.2	-2.0	-2.1	-2.6	-3.0
	MP	-3.9	-3.2	-2.3	-2.6	-2.7	-3.4	-2.1	-2.0	-2.6	-2.6
LMH2	FS	-3.4	-3.6	-2.3	-2.4	-2.3	-4.1	-2.1	-2.3	-2.7	-3.2
	MP	-3.8	-3.4	-2.3	-2.5	-2.6	-4.4	-2.1	-2.3	-2.6	-3.0
LMH3	FS	-3.5	-3.6	-2.4	-2.4	-2.4	-4.1	-2.2	-2.3	-2.8	-3.1
	MP	-4.0	-3.4	-2.6	-2.9	-3.1	-4.4	-2.0	-2.1	-2.7	-2.4
LMH4	FS	-3.0	-3.8	-2.5	-2.4	-2.6	-4.6	-2.2	-2.4	-2.8	-3.0
	MP	-3.4	-3.4	-2.3	-2.4	-2.5	-4.3	-2.1	-2.4	-2.8	-3.1

Average Gain (dB) – MH

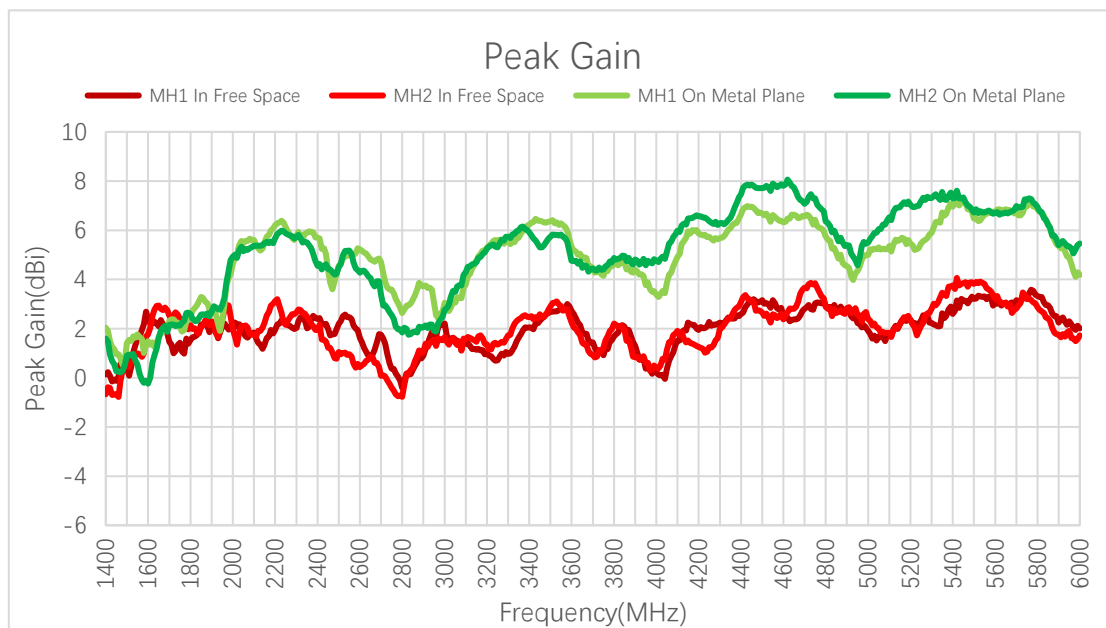
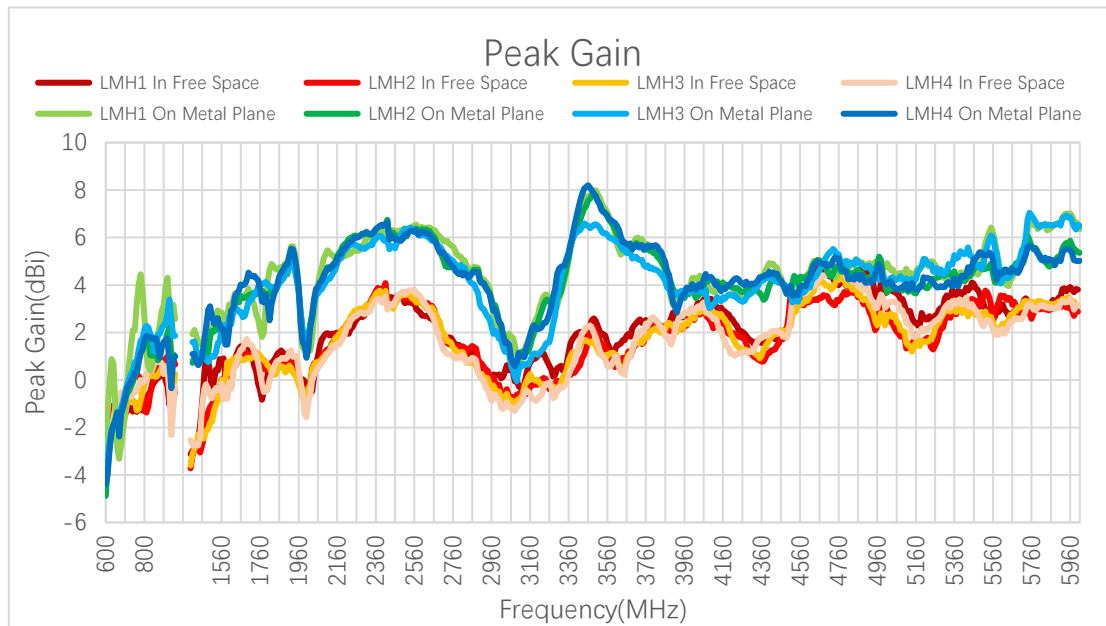
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	-5.1	-3.8	-3.6	-3.3
	MP	-	-	-	-	-	-	-5.5	-5.5	-5.4	-4.6
MH2	FS	-	-	-	-	-	-	-5.0	-3.8	-3.3	-3.0
	MP	-	-	-	-	-	-	-6.1	-6.1	-6.1	-4.9
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	-2.9	-2.7	-1.6	-2.3	-2.5	-2.6	-2.8	-2.3	-2.2	-3.5
	MP	-4.0	-2.2	-2.2	-2.7	-3.1	-3.6	-2.7	-2.5	-2.6	-3.5
MH2	FS	-2.7	-2.4	-1.8	-2.3	-2.8	-3.0	-2.3	-2.0	-2.5	-3.7
	MP	-3.8	-2.4	-2.2	-2.8	-2.8	-4.3	-2.6	-2.6	-2.9	-3.5



Average Gain(dB) – GNSS

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Average Gain (dB)	-0.9	-	-	-	-	-3.37	-2.47	-4.03

3.2.3. Peak Gain



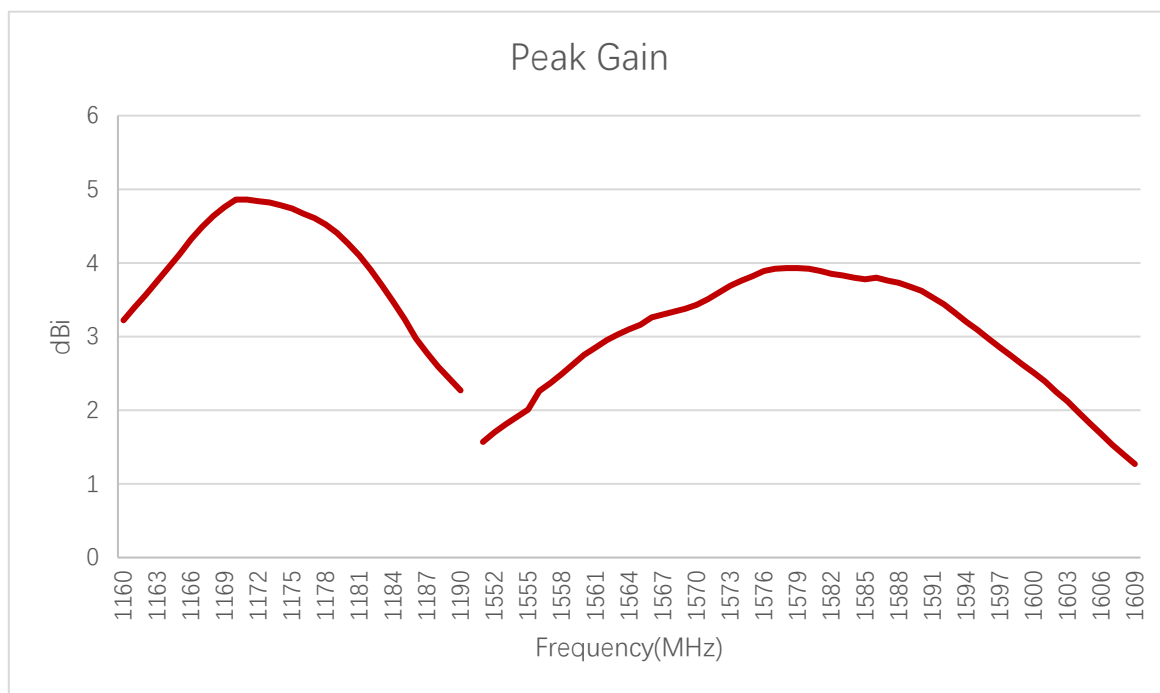
Peak Gain (dBi) – LMH

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	-2.9	-1.8	-1.3	-0.5	0.2	-0.5	-2.5	1.2	0.4	1.1
	MP	-2.8	0.9	-0.4	0.4	3.2	2.6	1.5	3.4	2.6	4.9
LMH2	FS	-2.1	-1.1	-0.3	-0.6	0.8	0.7	-2.8	1.1	1.1	0.8
	MP	-4.9	-2.2	-0.6	1.1	1.5	1.0	1.1	3.6	3.7	4.5

LMH3	FS	-2.7	-2.4	-1.0	0.2	0.5	0.2	-2.3	0.9	1.2	0.5
	MP	-3.7	-2.1	-0.2	2.0	2.3	1.9	0.9	3.4	3.9	4.5
LMH4	FS	-2.9	-2.1	-0.5	0.4	0.3	-0.3	-2.8	1.5	1.1	0.9
	MP	-4.4	-2.2	-0.4	1.8	1.6	1.0	0.8	4.4	4.2	4.8
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	0.2	1.9	3.6	3.4	2.7	1.3	4.5	3.7	3.3	3.8
	MP	3.8	5.1	6.2	6.2	6.4	5.7	4.9	4.9	5.3	6.4
LMH2	FS	0.7	1.6	3.6	3.1	3.3	0.5	3.5	3.1	3.2	2.9
	MP	3.7	4.9	6.3	6.1	6.3	6.2	4.4	3.7	4.7	5.4
LMH3	FS	0.1	1.5	3.5	3.0	3.2	1.1	4.0	2.3	2.4	3.2
	MP	3.7	4.6	5.9	5.5	6.1	5.8	5.4	4.2	4.9	6.5
LMH4	FS	1.0	1.3	3.2	3.2	3.4	1.0	4.4	3.0	2.4	3.2
	MP	3.9	4.9	6.4	5.9	6.2	6.5	4.8	4.1	5.2	5.0

Peak Gain (dBi) – MH

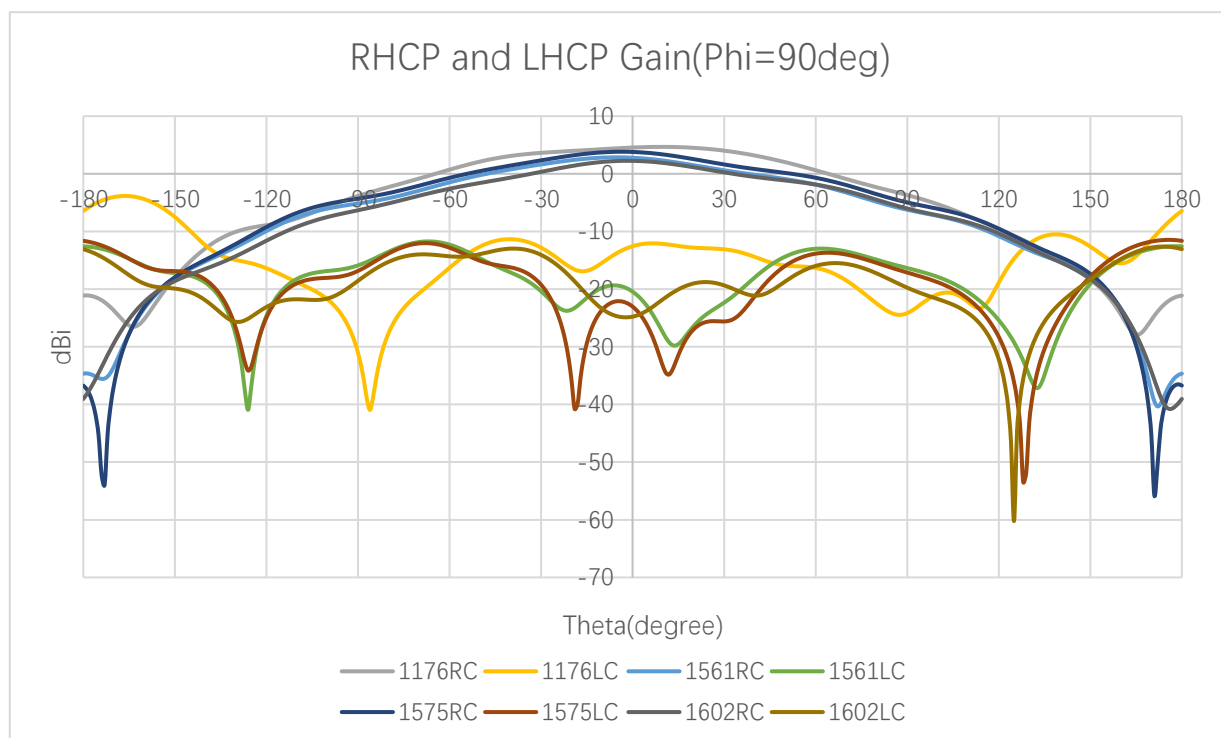
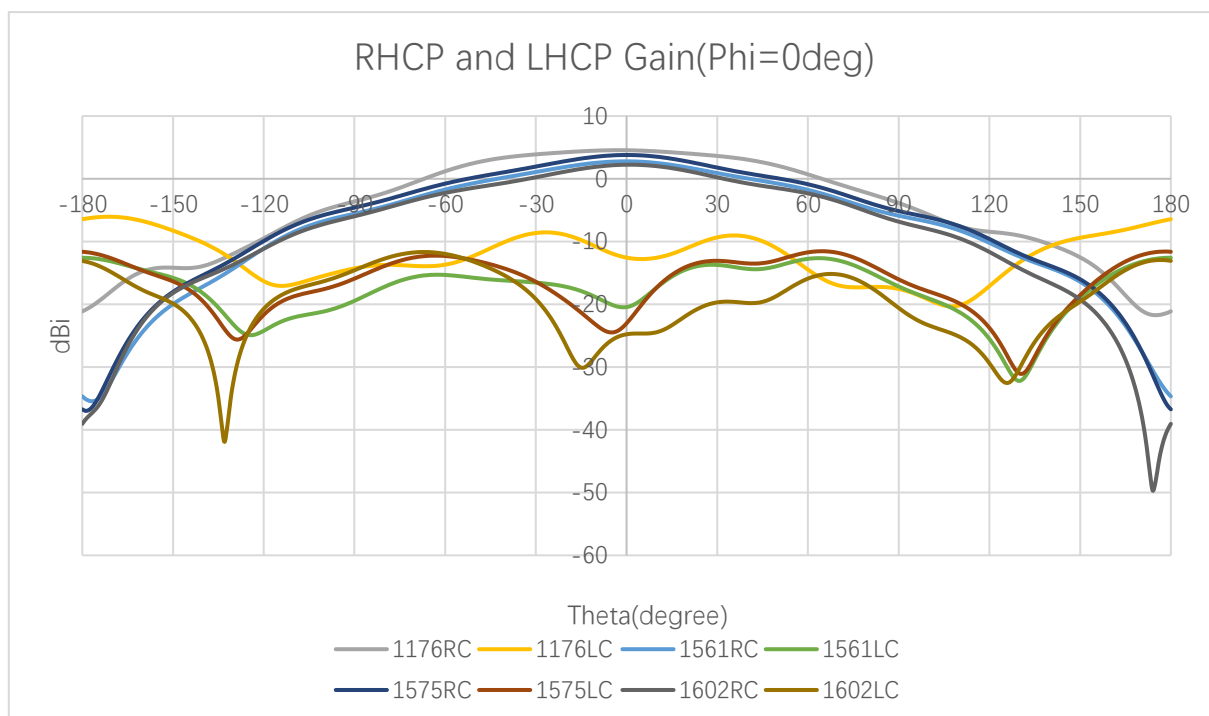
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	1.4	1.3	2.1	1.4
	MP	-	-	-	-	-	-	2.4	2.3	3.0	2.4
MH2	FS	-	-	-	-	-	-	2.4	2.6	2.3	2.4
	MP	-	-	-	-	-	-	2.2	2.1	2.6	2.2
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	2.1	1.2	2.0	2.0	1.6	2.7	2.8	1.9	3.2	2.0
	MP	2.4	5.3	5.9	4.4	5.2	5.3	6.6	5.0	6.5	4.2
MH2	FS	2.4	2.0	2.5	1.2	0.4	2.3	3.7	2.4	3.8	1.7
	MP	3.0	5.4	5.5	4.4	4.3	4.8	7.1	5.5	6.7	5.5



Peak Gain (dBi) – GNSS

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Peak Gain (dBi)	4.67	-	-	-	-	2.85	3.82	2.25

3.2.4. GNSS 2D RHCP and LHCP Gain



2D RHCP and LHCP Gain (dBi)

Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
RC Gain (dBi)	Phi = 0 (deg) Theta = 0 (deg)	4.55	-	-	-	-	2.78	3.79	2.24
	Phi = 90 (deg) Theta = 0 (deg)	4.55	-	-	-	-	2.78	3.79	2.24
LC Gain (dBi)	Phi = 0 (deg) Theta = 0 (deg)	-12.56	-	-	-	-	-20.4	-23	-24.7
	Phi = 90 (deg) Theta = 0 (deg)	-12.56	-	-	-	-	-20.4	-23	-24.7

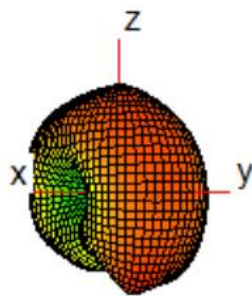
3.2.5. 3D & 2D Radiation Pattern

3.2.5.1. Test Status: In Free Space

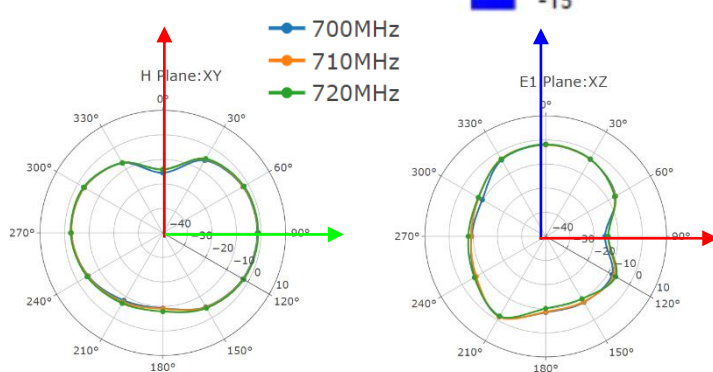
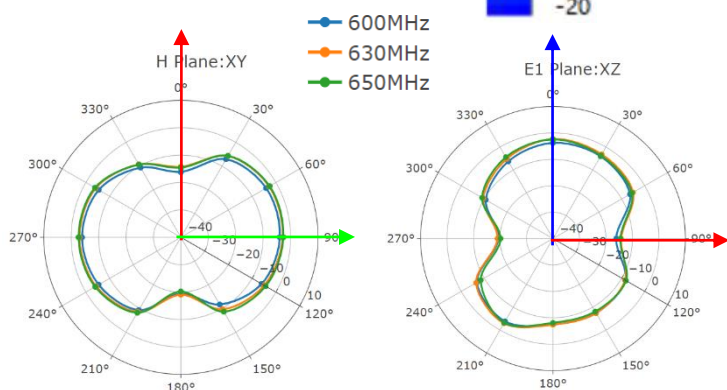
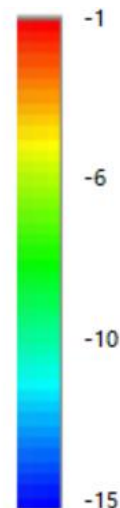
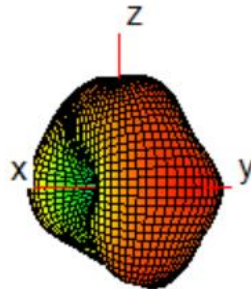


● **LMH1**

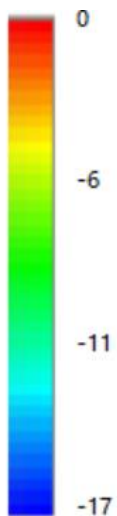
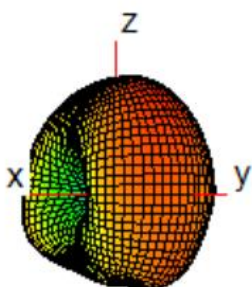
630 MHz



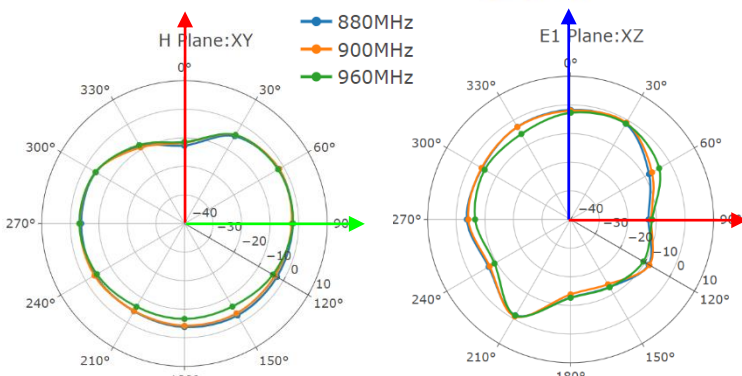
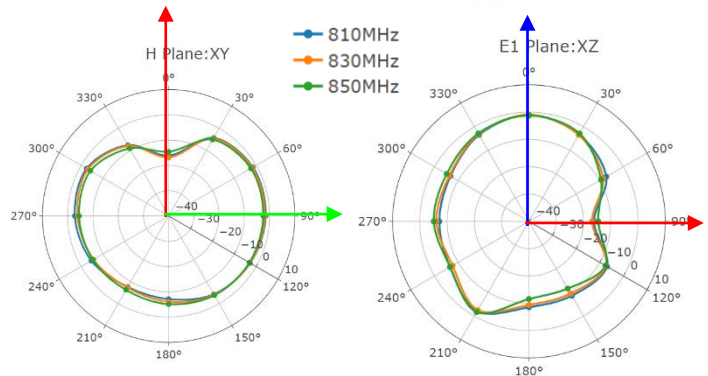
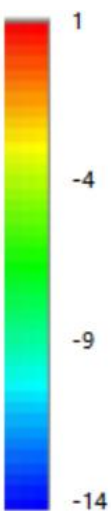
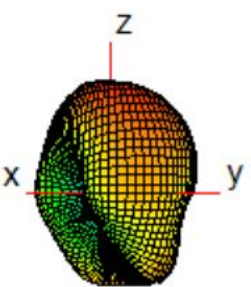
710 MHz



830 MHz

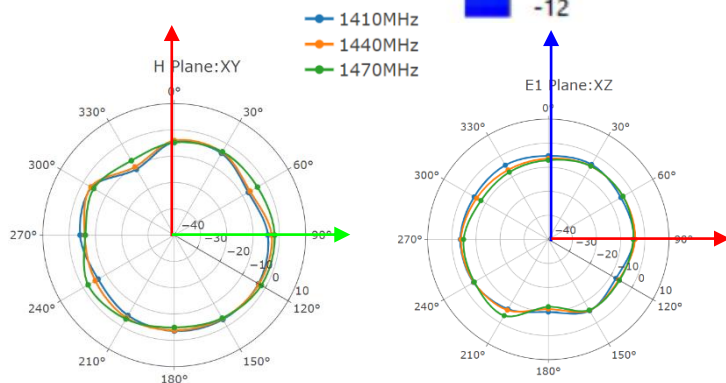


900 MHz

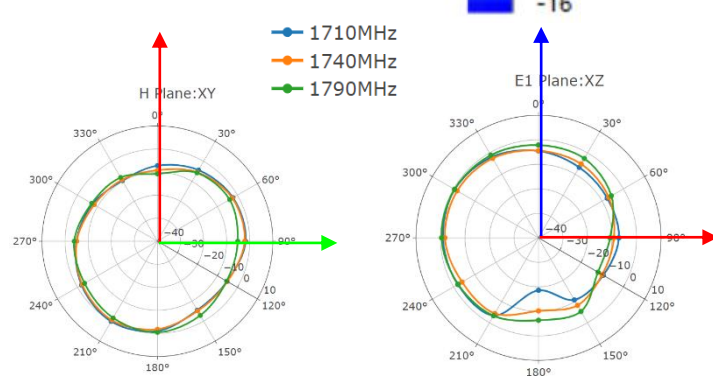
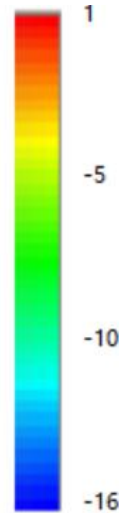


● **LMH1**

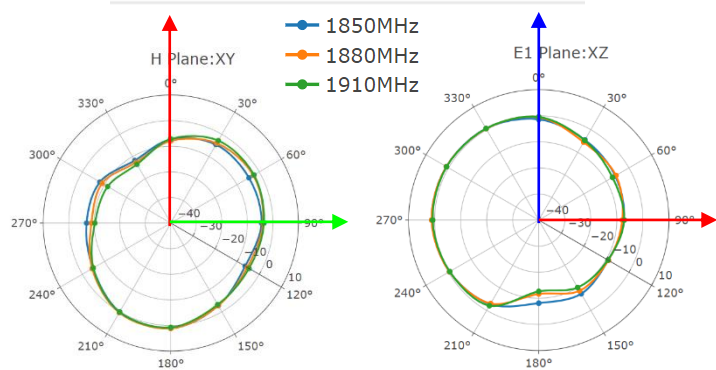
1440 MHz



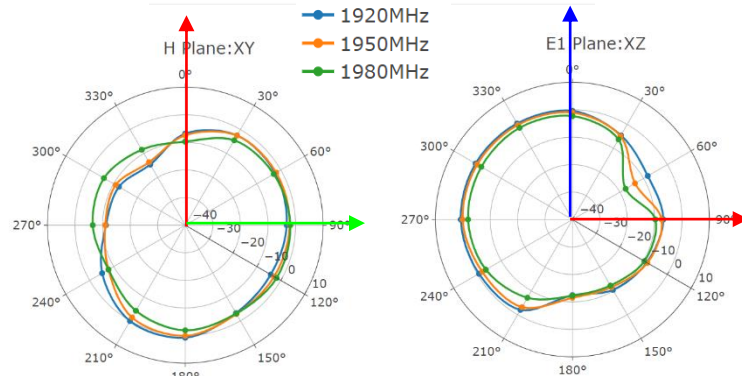
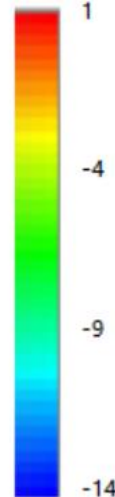
1740 MHz



1880 MHz

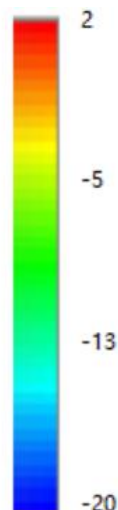


1950 MHz

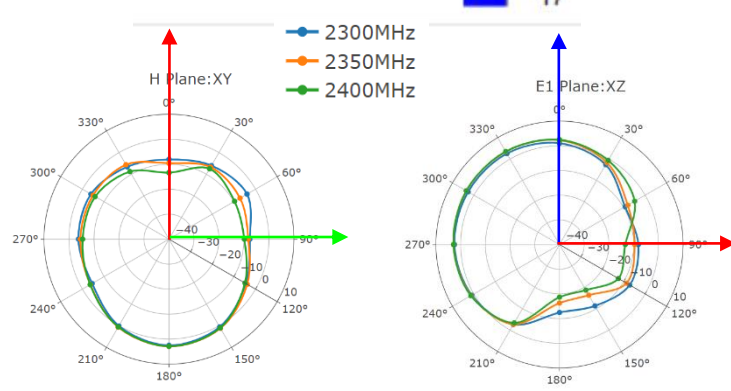
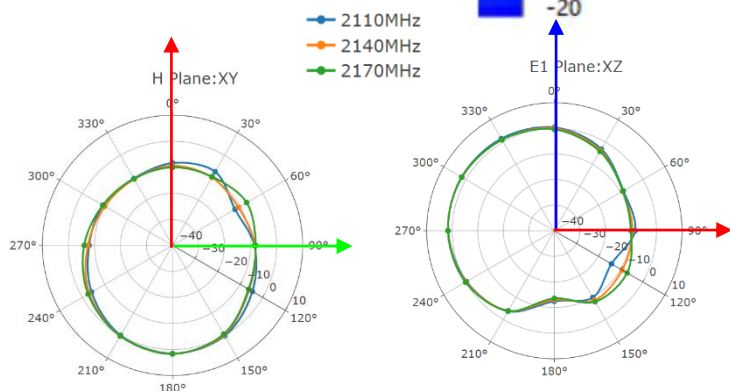
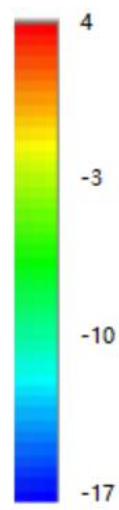


● **LMH1**

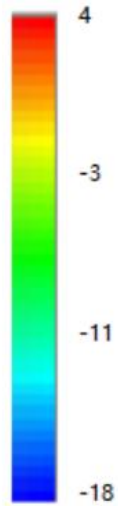
2140 MHz



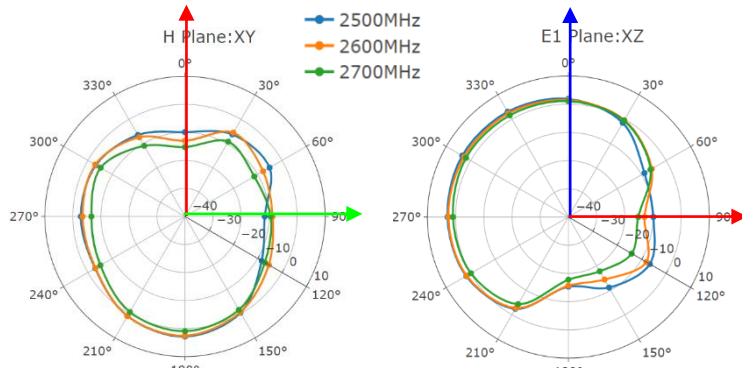
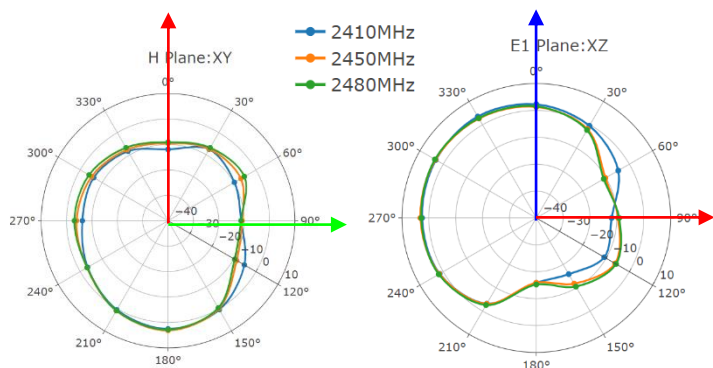
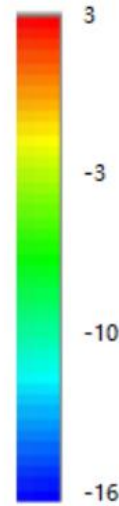
2350 MHz



2450 MHz

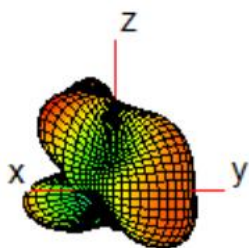


2600 MHz

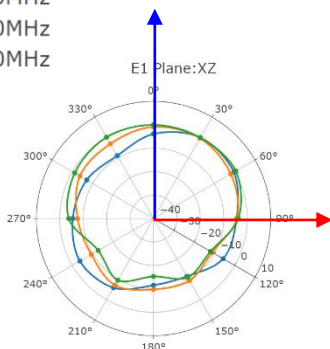
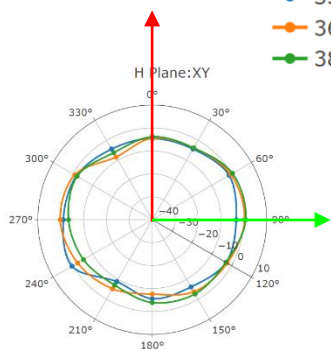


● **LMH1**

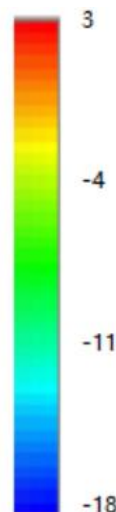
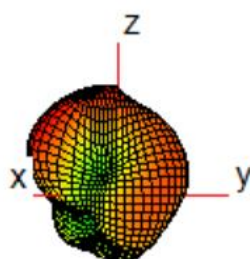
3600 MHz



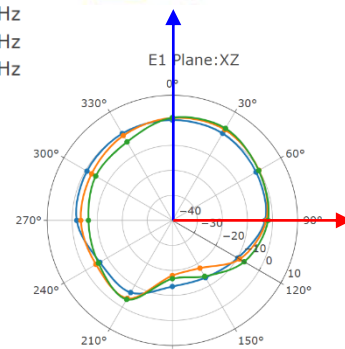
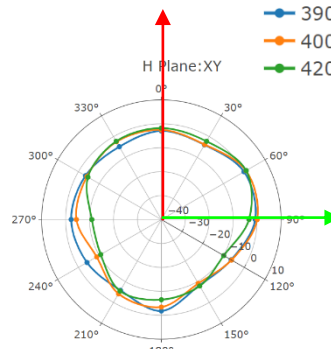
— 3300MHz
— 3600MHz
— 3800MHz



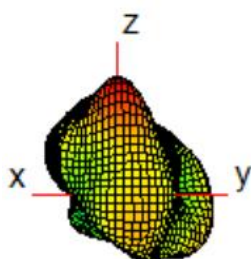
4000 MHz



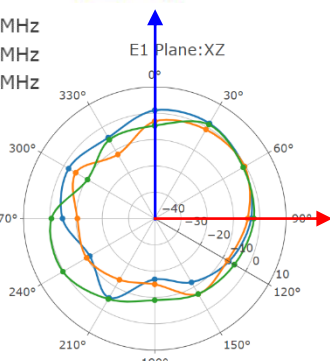
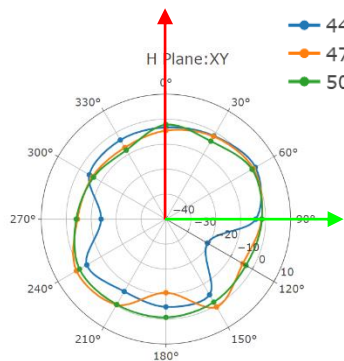
— 3900MHz
— 4000MHz
— 4200MHz



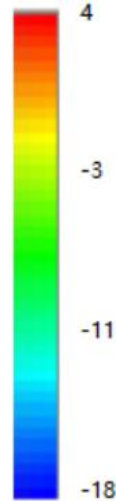
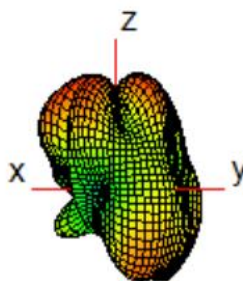
4700 MHz



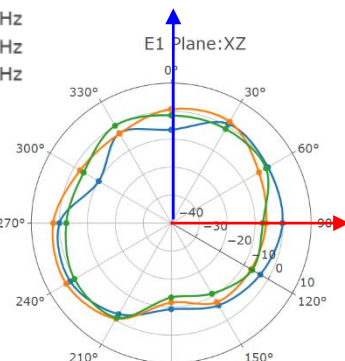
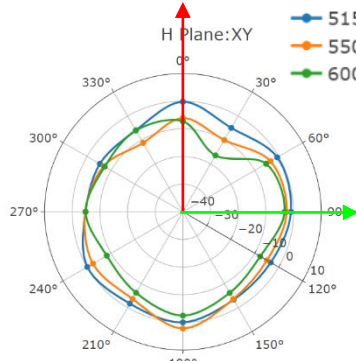
— 4400MHz
— 4700MHz
— 5000MHz



5500 MHz

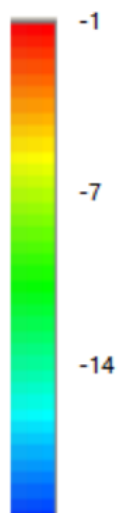
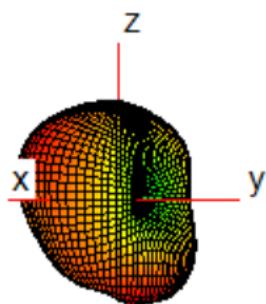


— 5150MHz
— 5500MHz
— 6000MHz

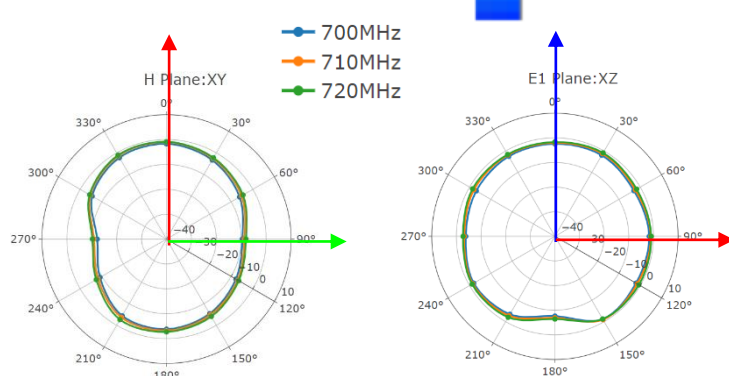
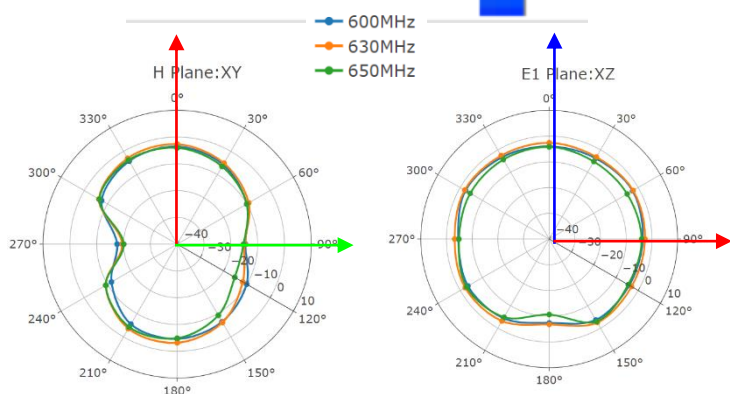
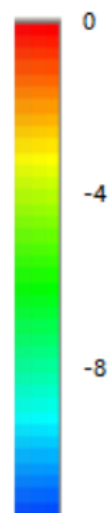
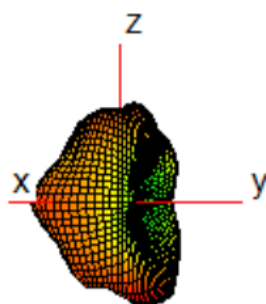


● **LMH2**

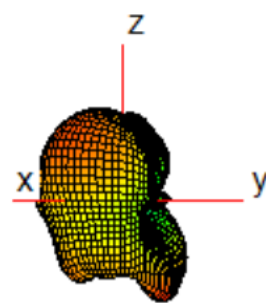
630 MHz



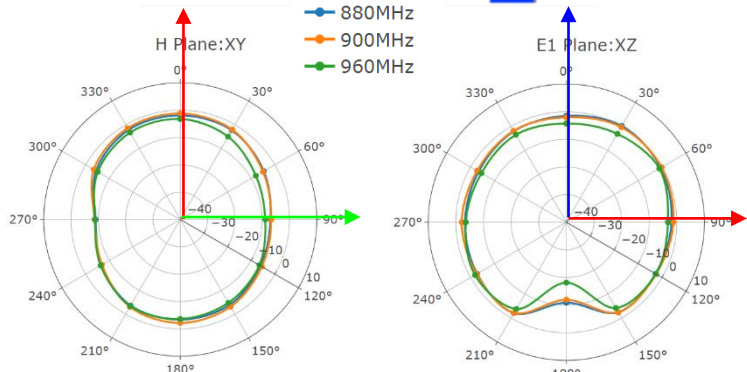
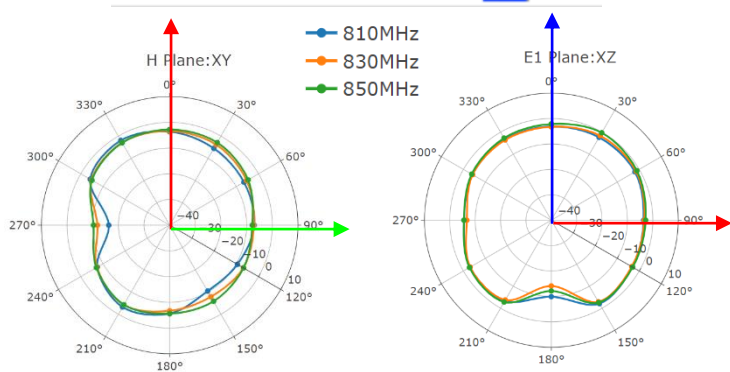
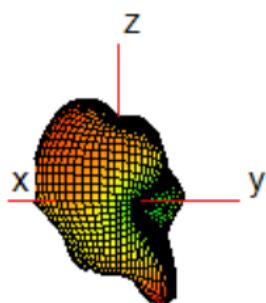
710 MHz



830MHz



900MHz

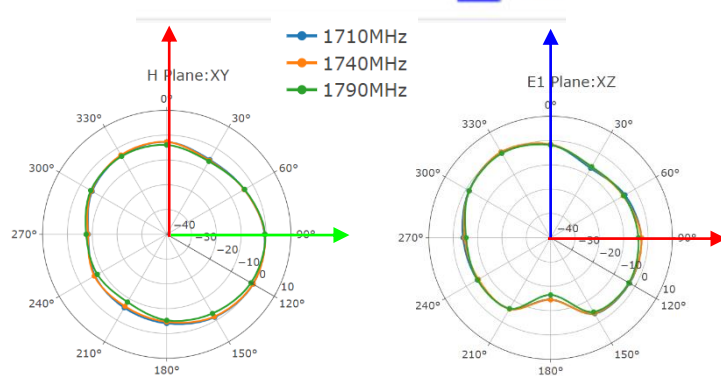
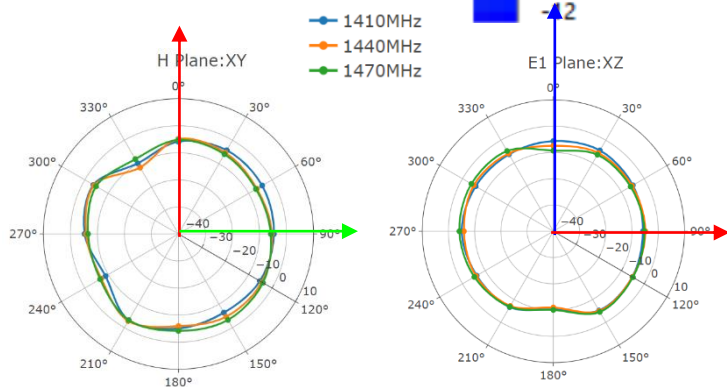
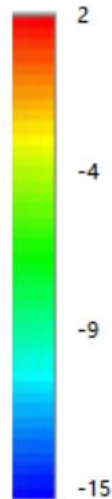


● **LMH2**

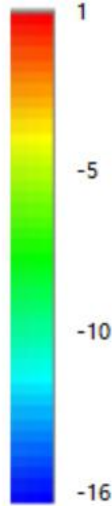
1440 MHz



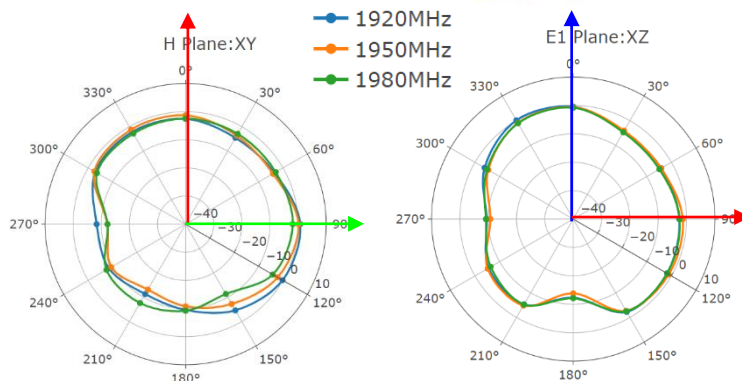
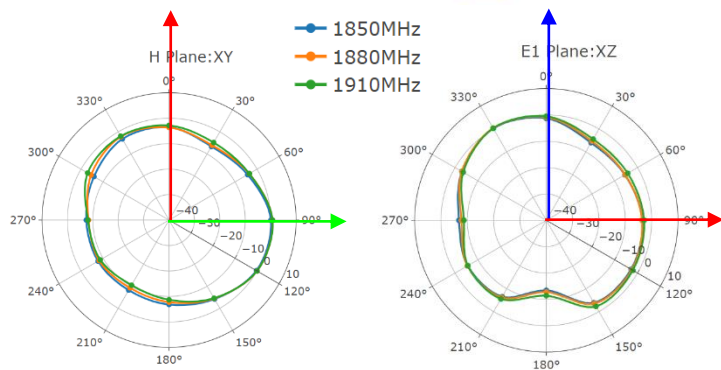
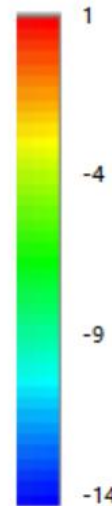
1740 MHz



1880 MHz

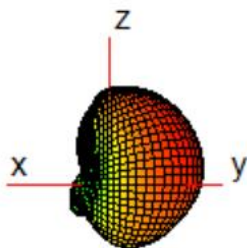


1950 MHz

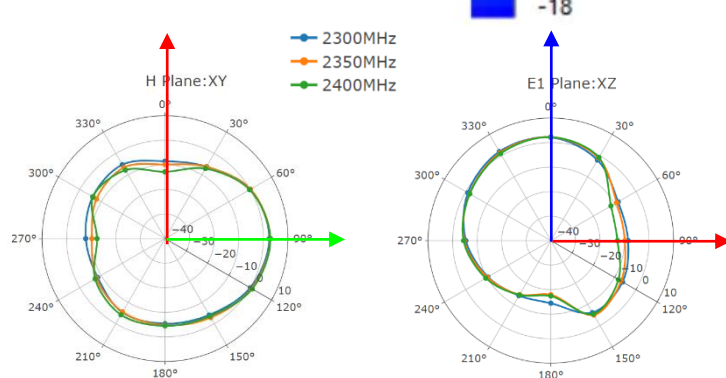
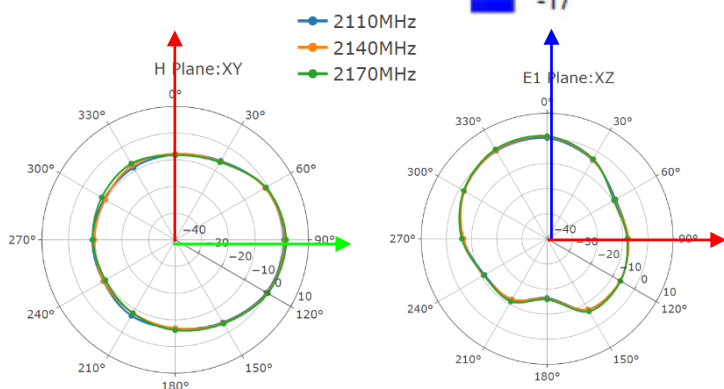
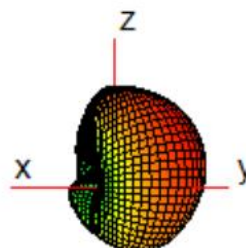


● **LMH2**

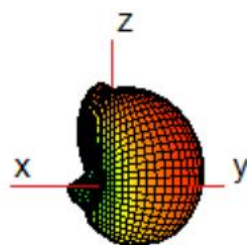
2140 MHz



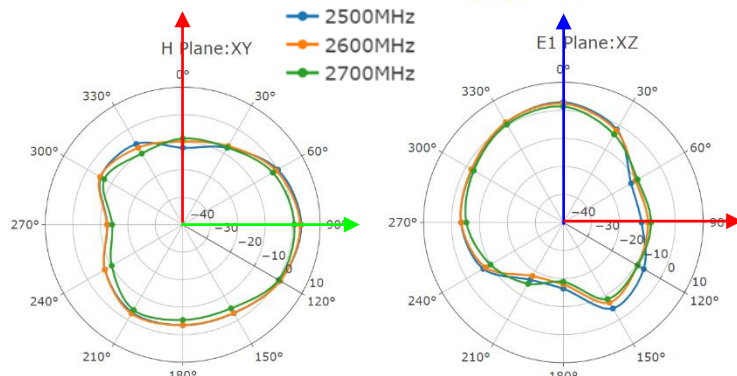
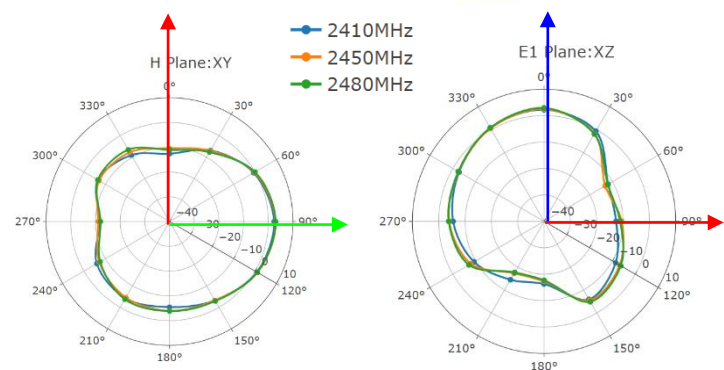
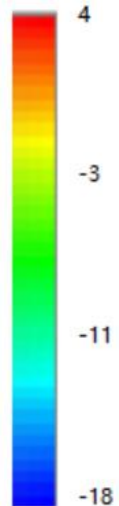
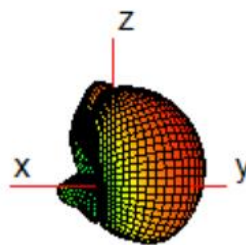
2350 MHz



2450 MHz

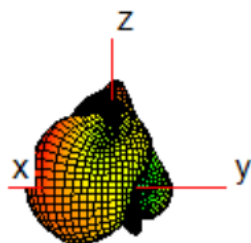


2600 MHz

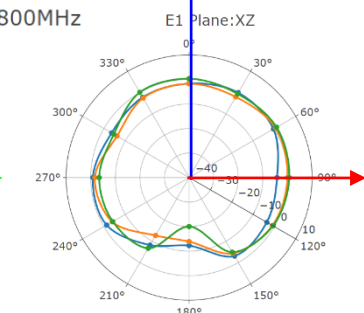
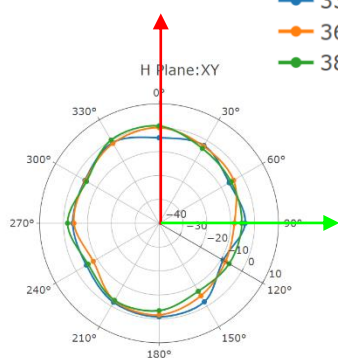


● **LMH2**

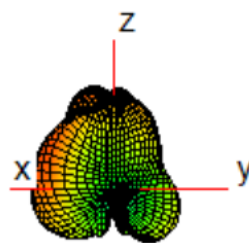
3600 MHz



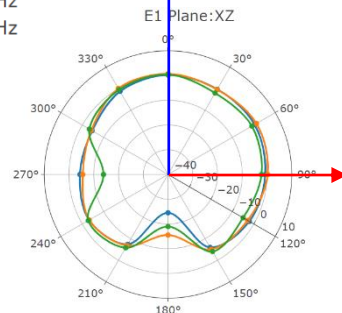
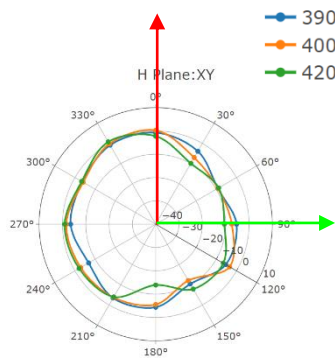
— 3300MHz
— 3600MHz
— 3800MHz



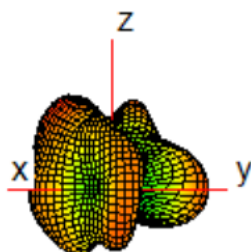
4000 MHz



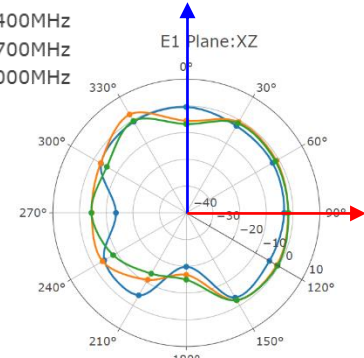
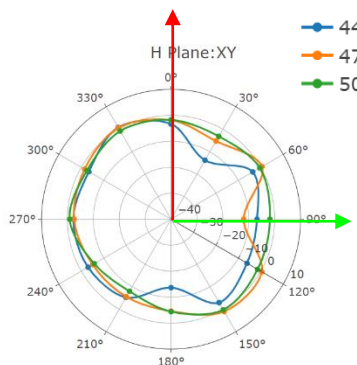
— 3900MHz
— 4000MHz
— 4200MHz



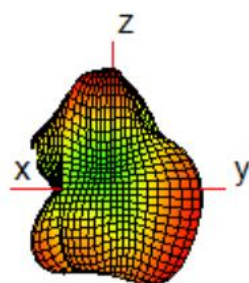
4700 MHz



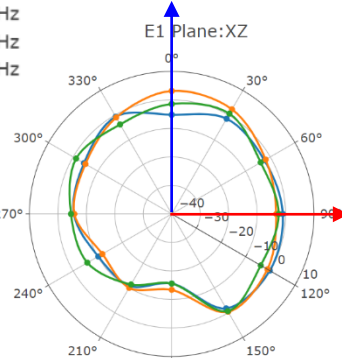
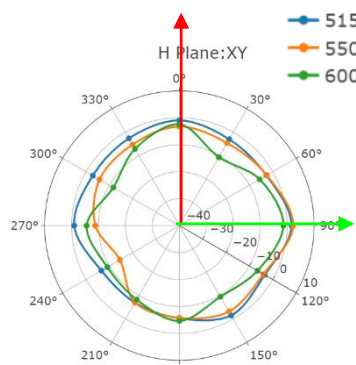
— 4400MHz
— 4700MHz
— 5000MHz



5500 MHz

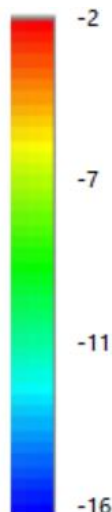
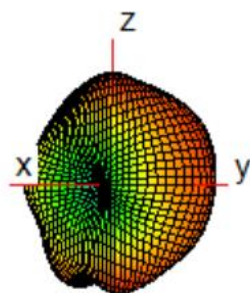


— 5150MHz
— 5500MHz
— 6000MHz

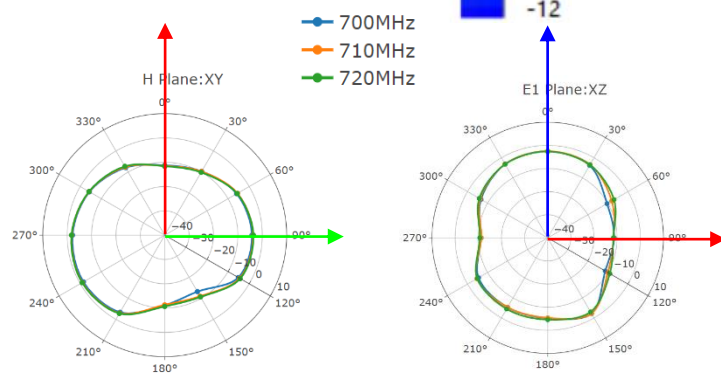
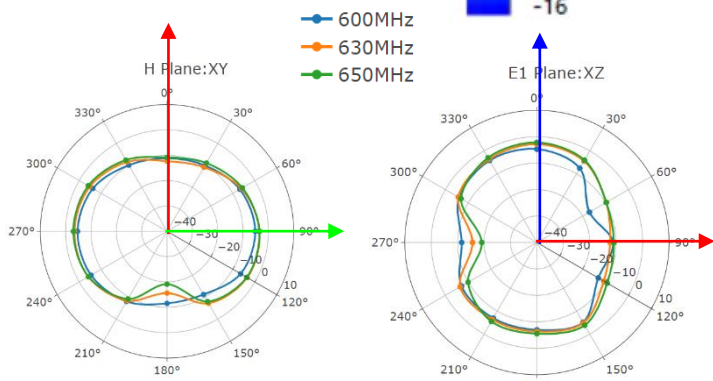
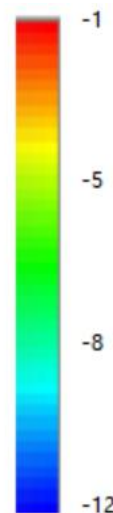
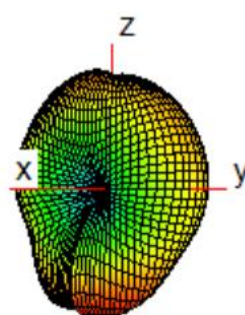


● **LMH3**

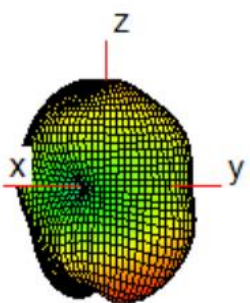
630 MHz



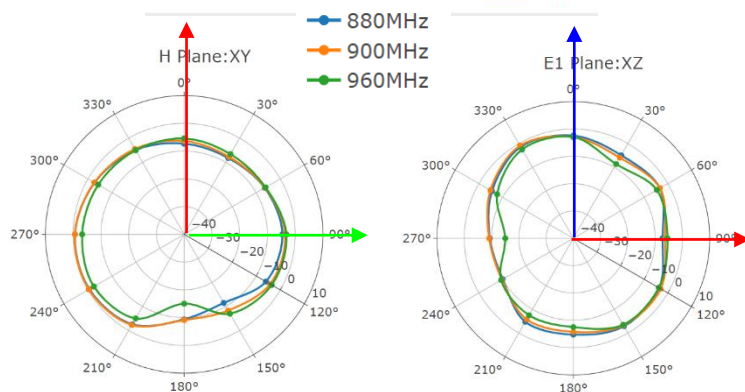
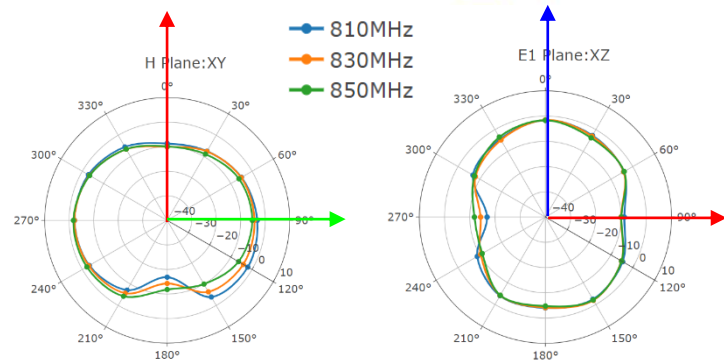
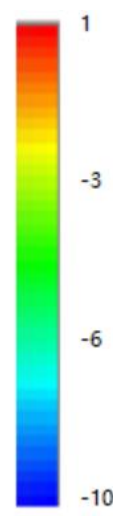
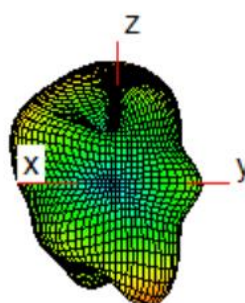
710 MHz



830 MHz

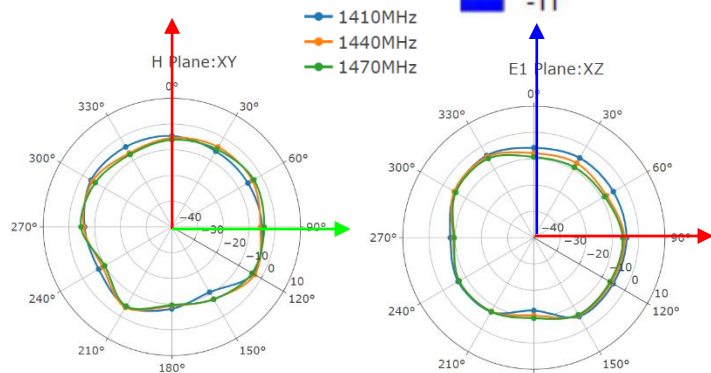
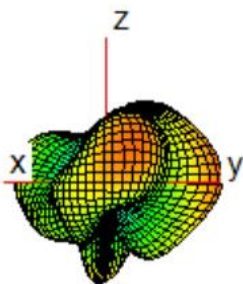
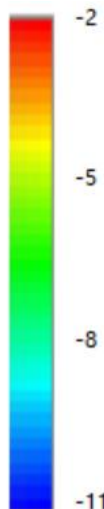


900 MHz

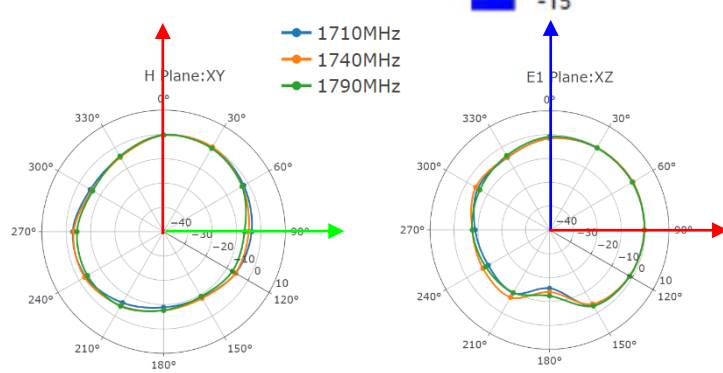
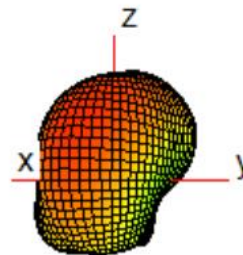


● **LMH3**

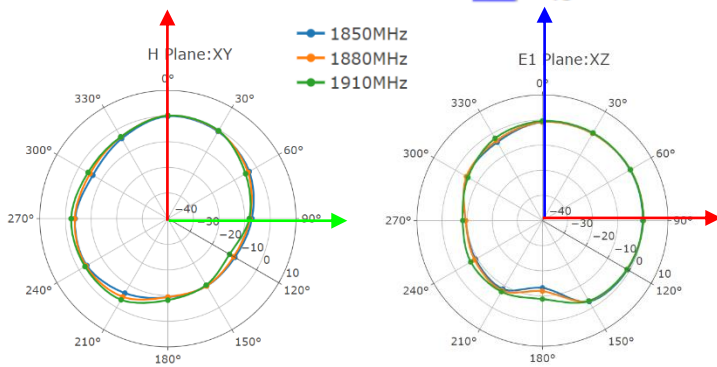
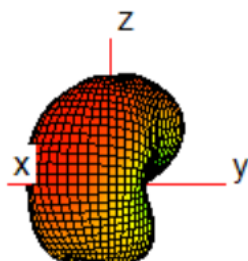
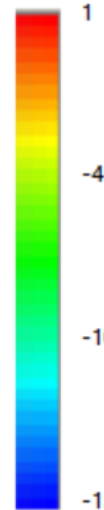
1440 MHz



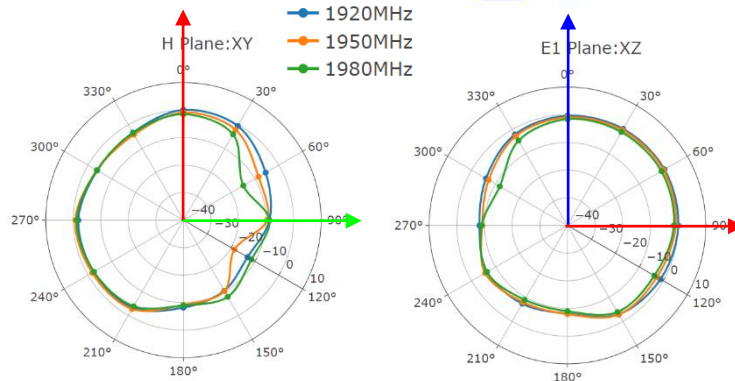
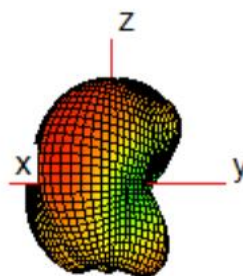
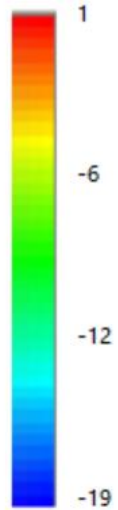
1740 MHz



1880 MHz

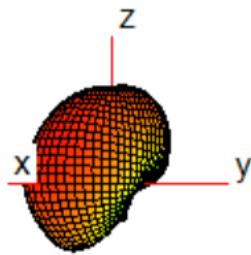


1950 MHz

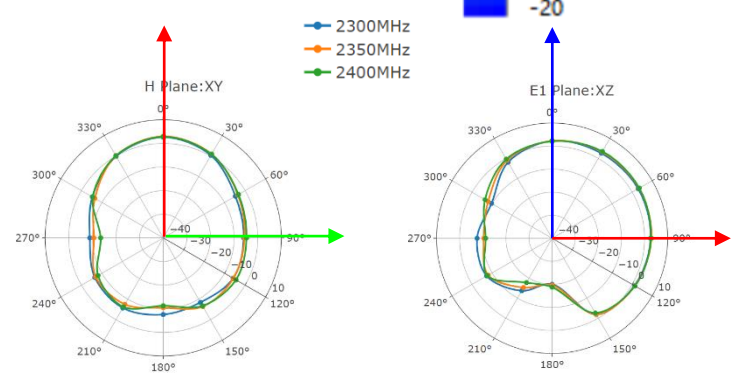
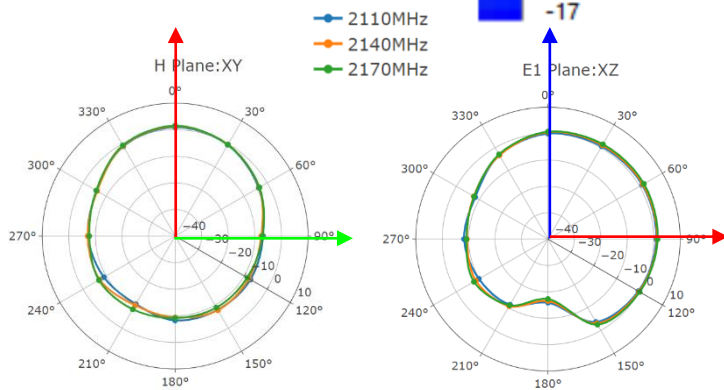
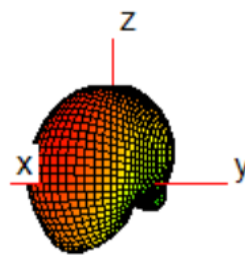


● **LMH3**

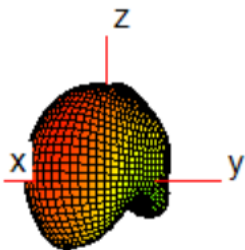
2140 MHz



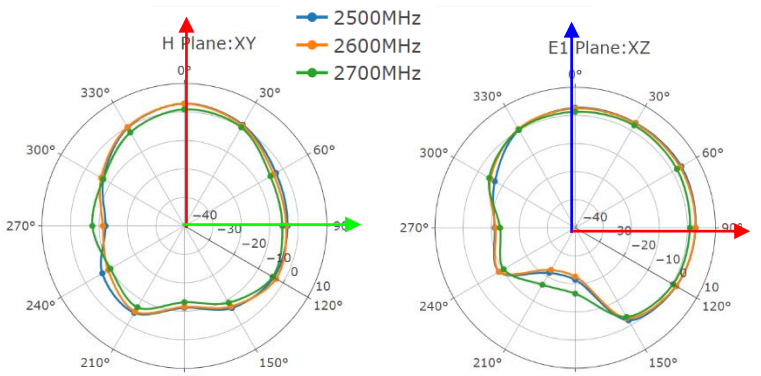
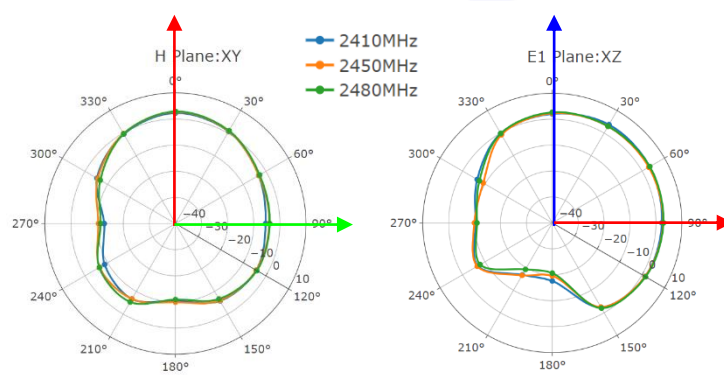
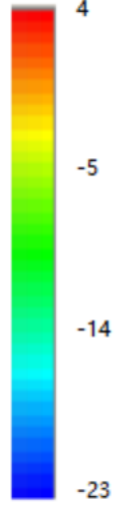
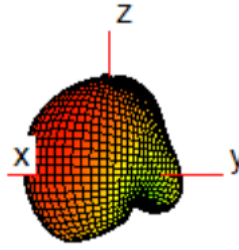
2350 MHz



2450 MHz

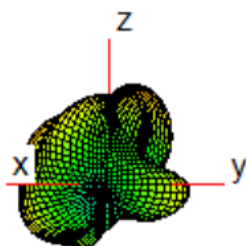


2600 MHz

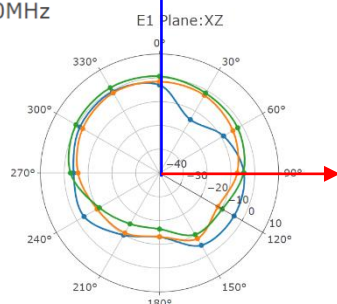
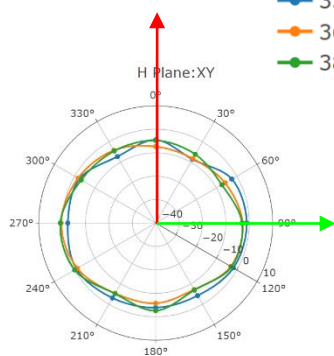


● **LMH3**

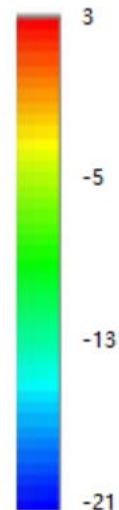
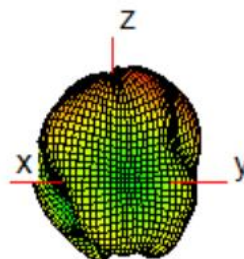
3600 MHz



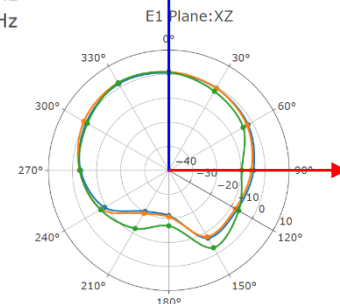
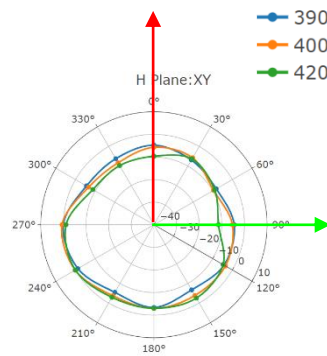
— 3300MHz
— 3600MHz
— 3800MHz



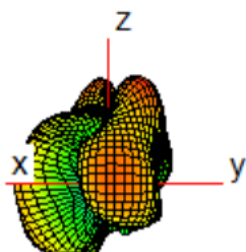
4000 MHz



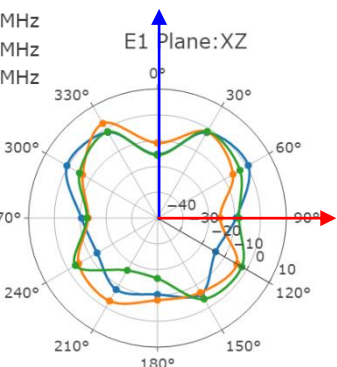
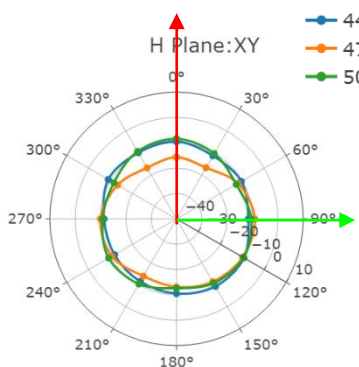
— 3900MHz
— 4000MHz
— 4200MHz



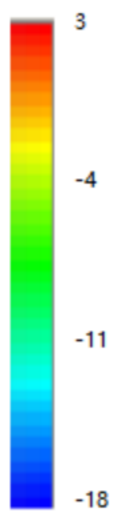
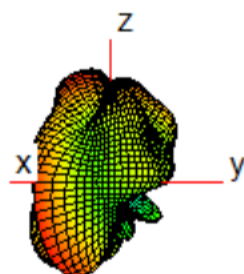
4700 MHz



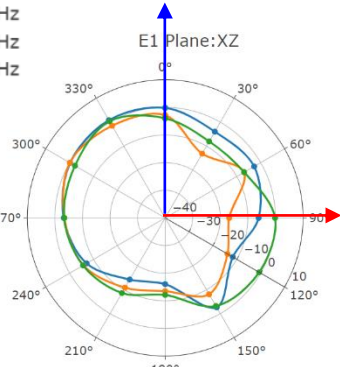
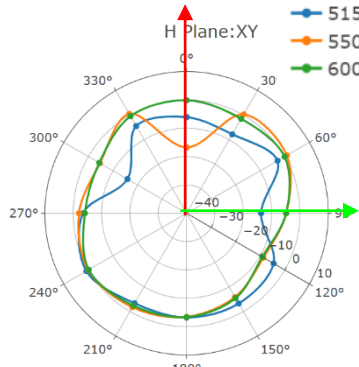
— 4400MHz
— 4700MHz
— 5000MHz



5500 MHz

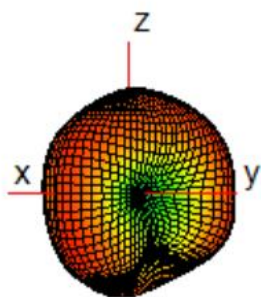


— 5150MHz
— 5500MHz
— 6000MHz

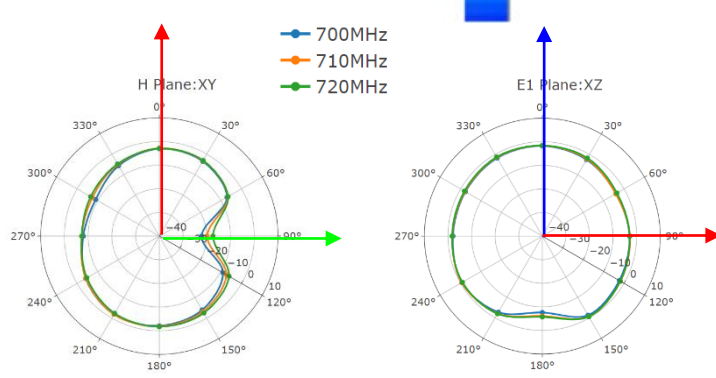
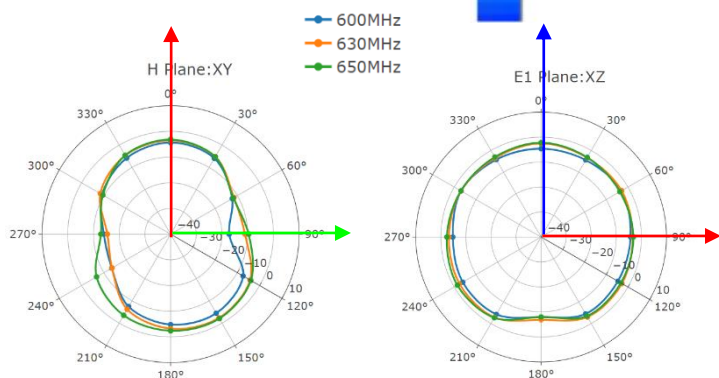
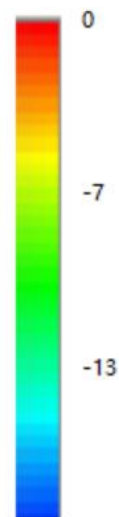
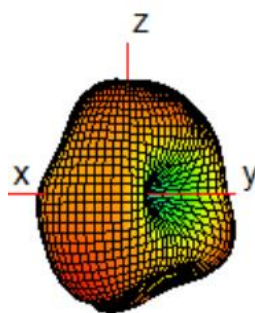


● **LMH4**

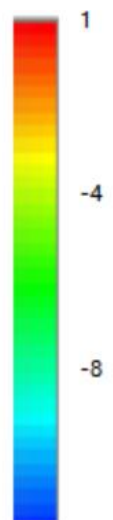
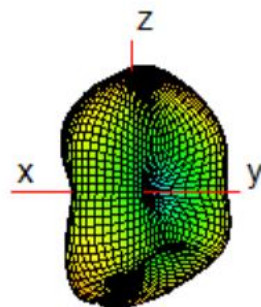
630 MHz



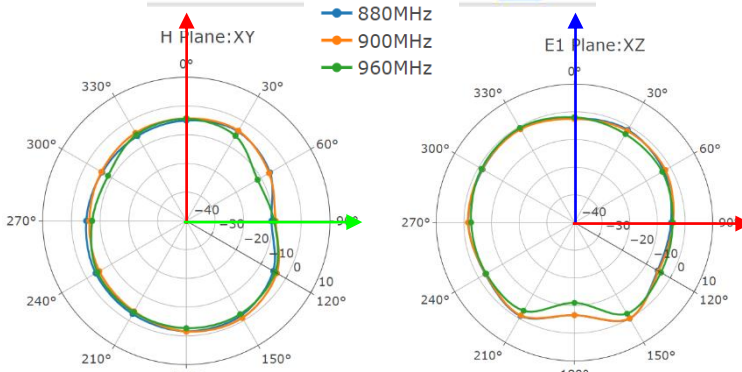
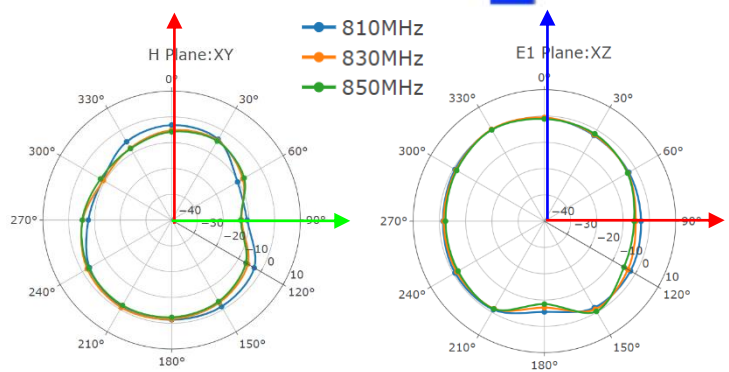
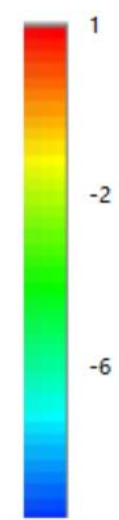
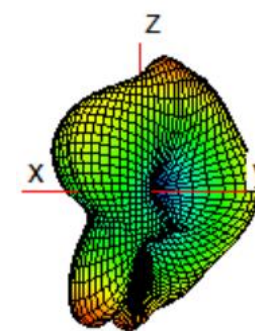
710 MHz



830 MHz

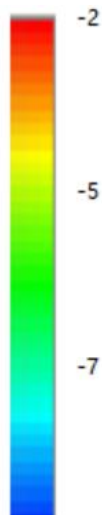


900 MHz

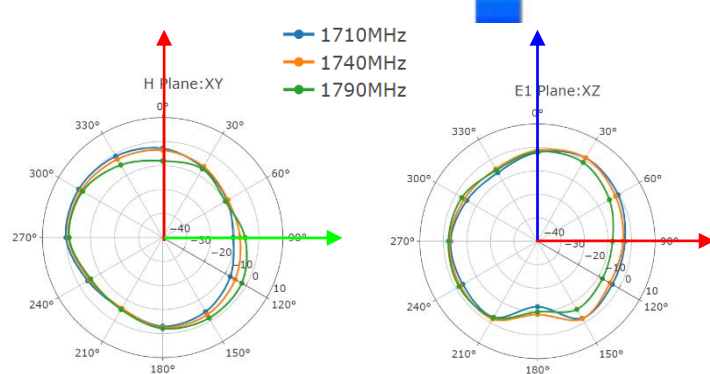
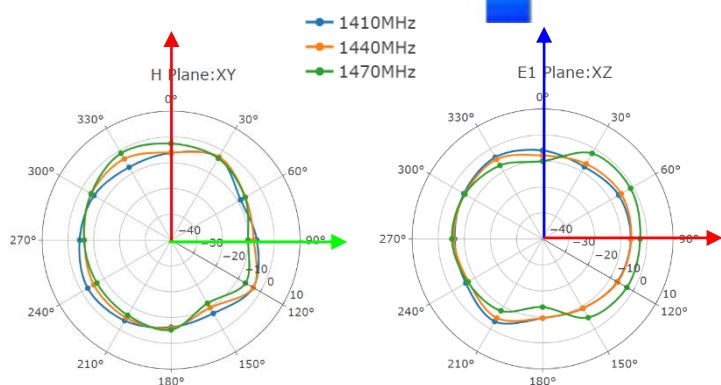
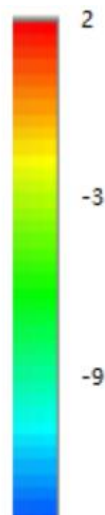


● **LMH4**

1440 MHz



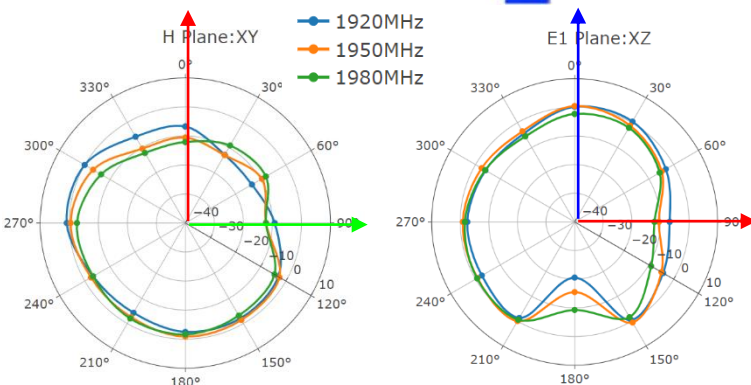
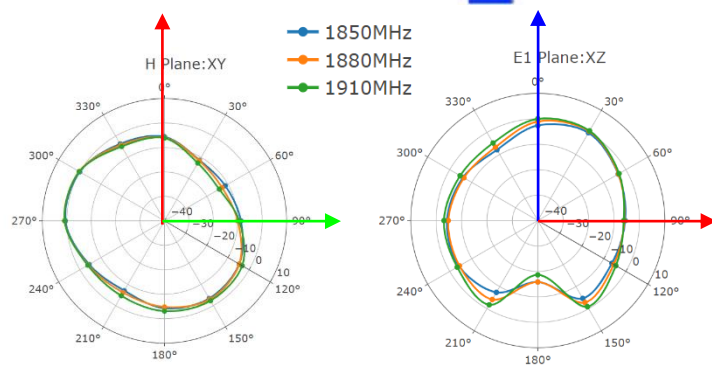
1740 MHz



1880 MHz

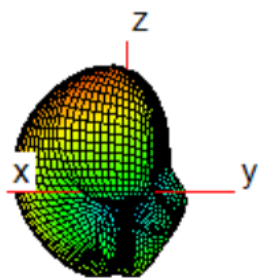


1950 MHz

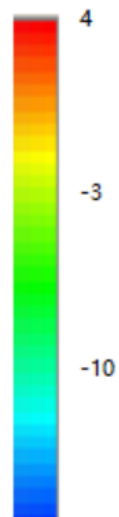
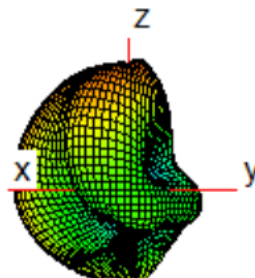


● **LMH4**

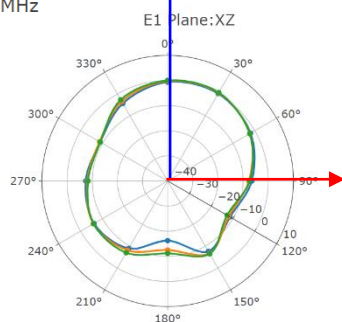
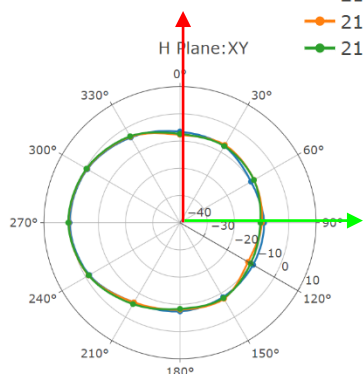
2140 MHz



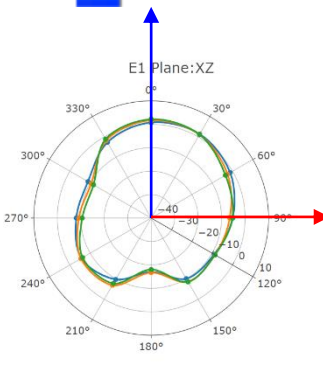
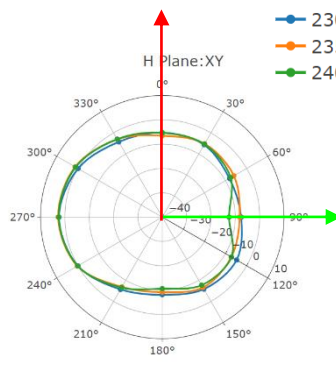
2350 MHz



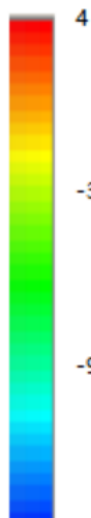
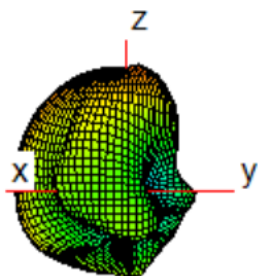
— 2110MHz
— 2140MHz
— 2170MHz



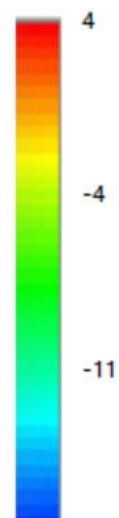
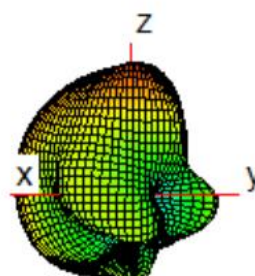
— 2300MHz
— 2350MHz
— 2400MHz



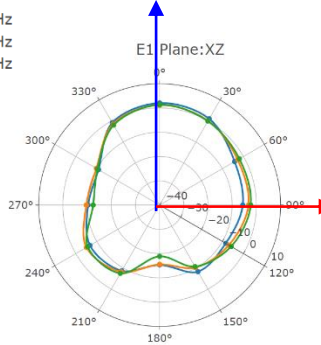
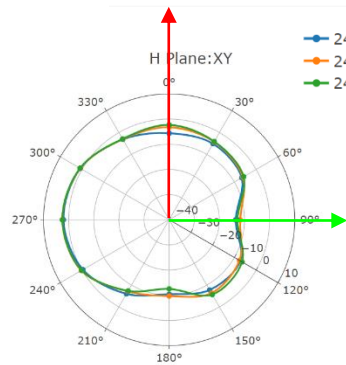
2450 MHz



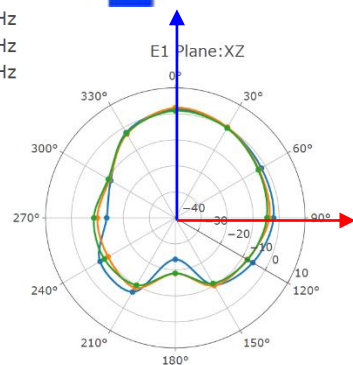
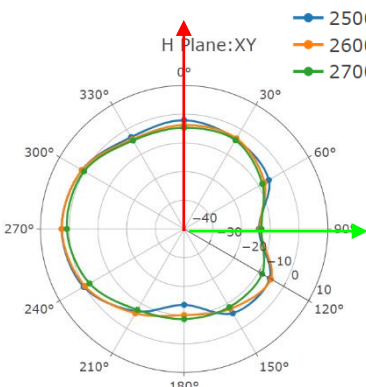
2600 MHz



— 2410MHz
— 2450MHz
— 2480MHz

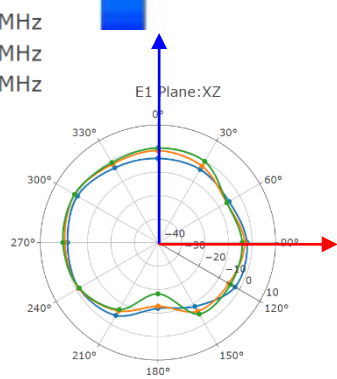
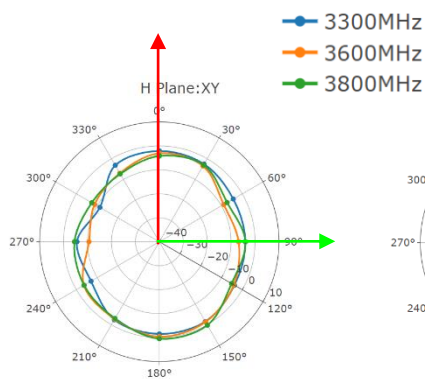
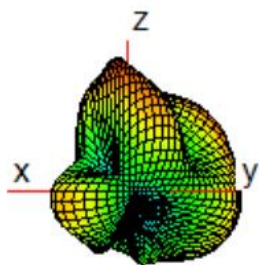


— 2500MHz
— 2600MHz
— 2700MHz

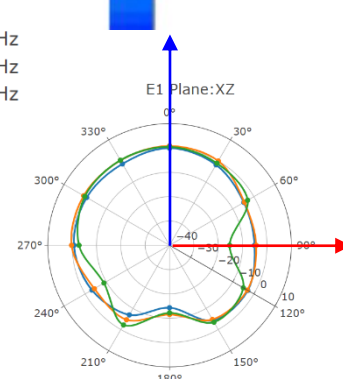
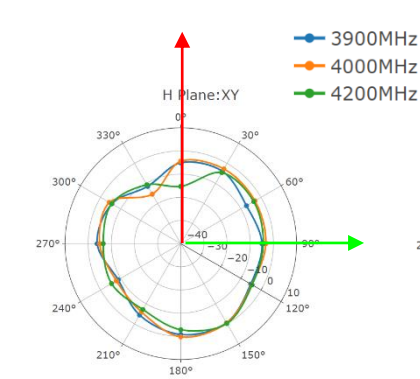
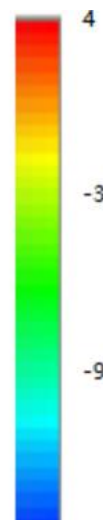
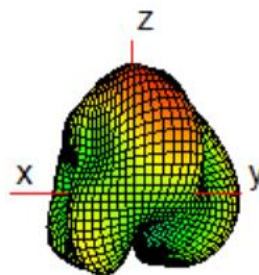


● **LMH4**

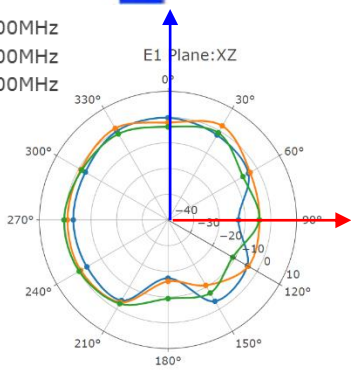
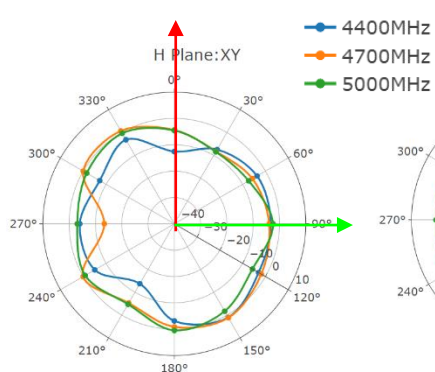
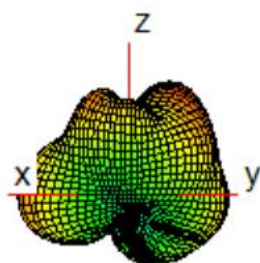
3600 MHz



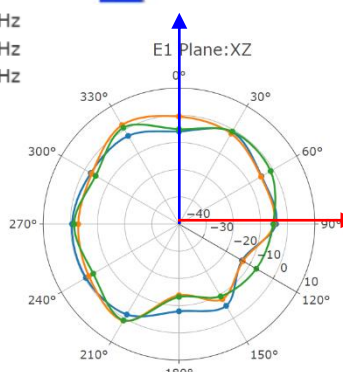
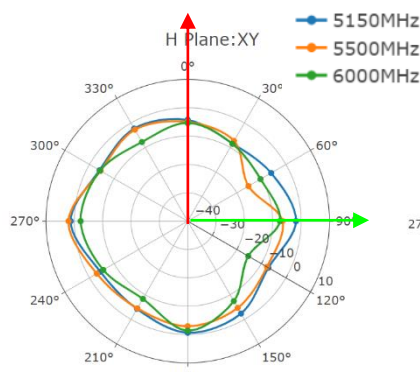
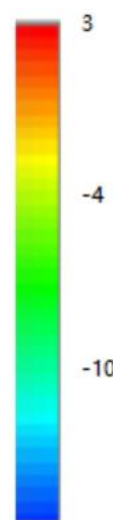
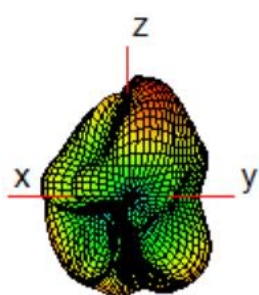
4000 MHz



4700 MHz

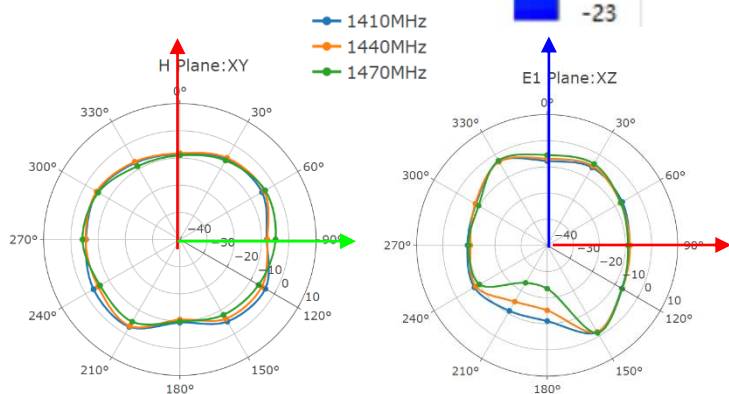
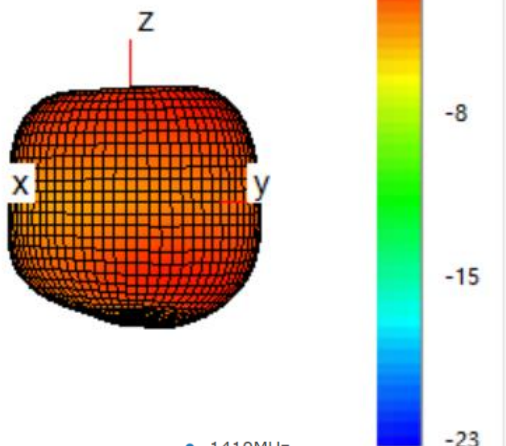


5500 MHz

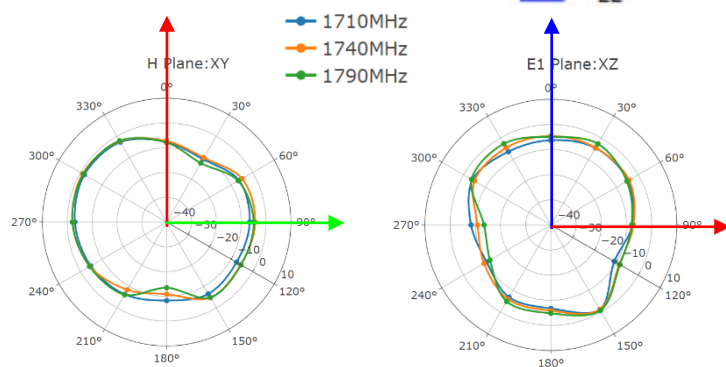
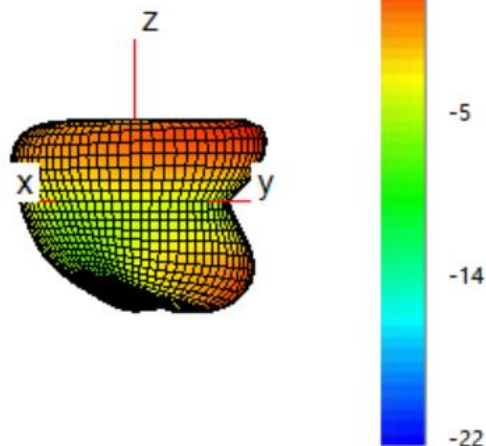


● **MH1**

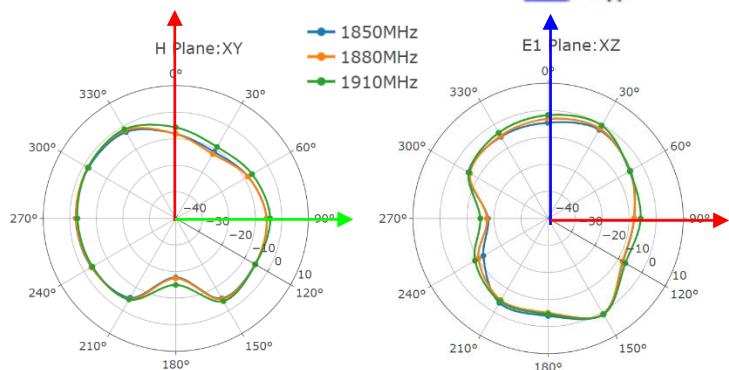
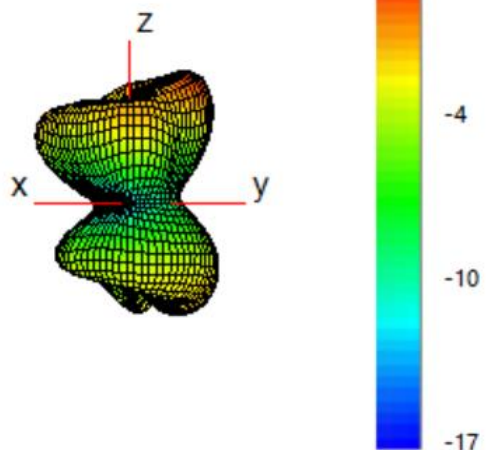
1440 MHz



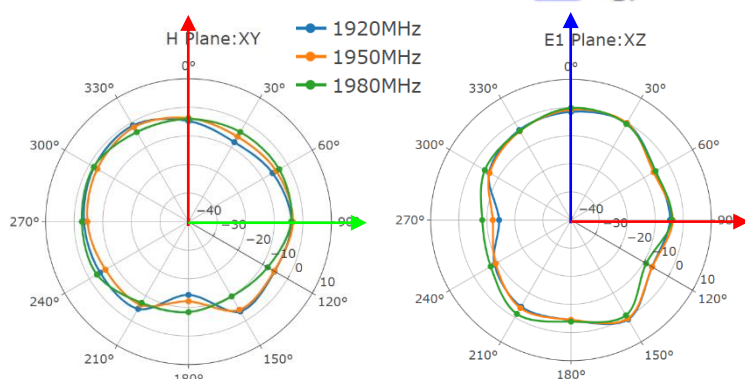
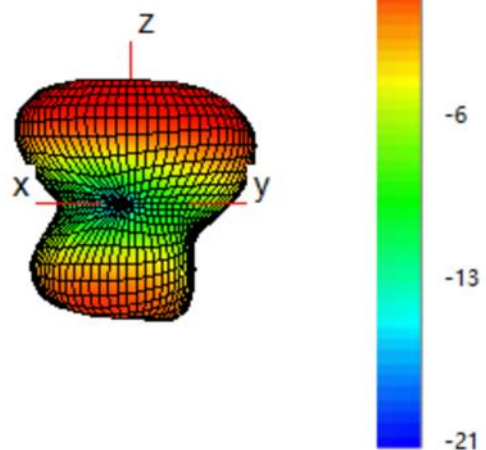
1740 MHz



1880 MHz

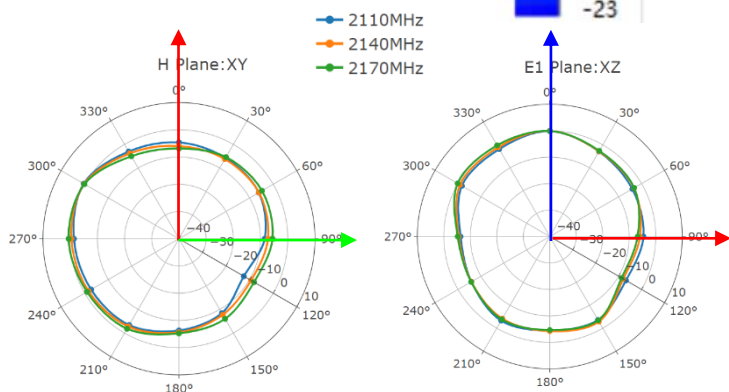
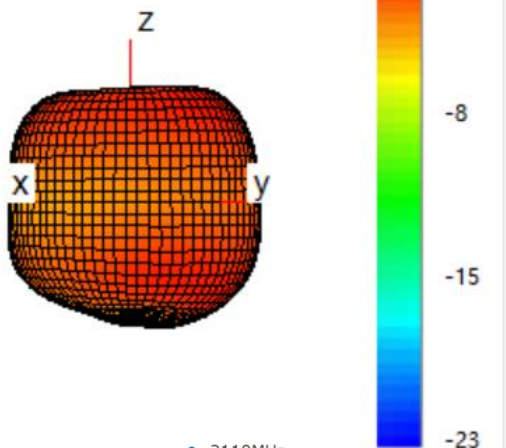


1950 MHz

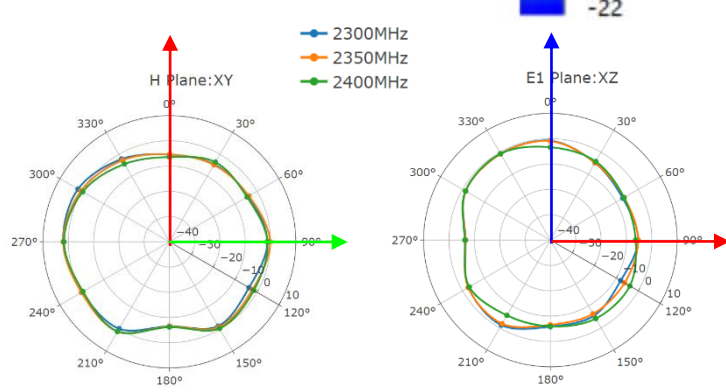
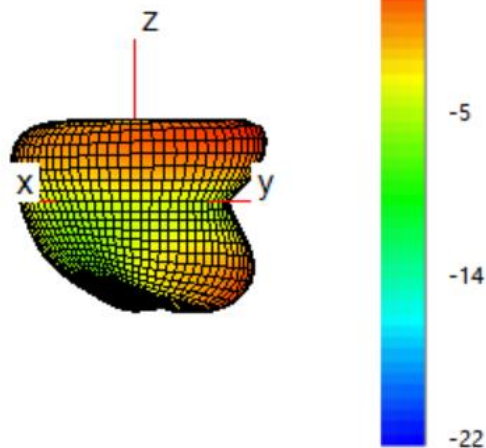


● **MH1**

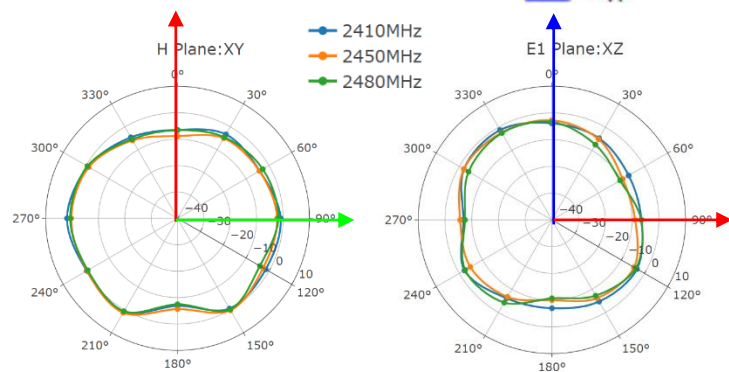
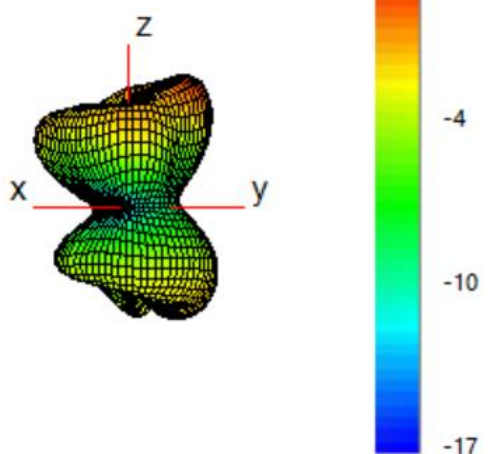
2140 MHz



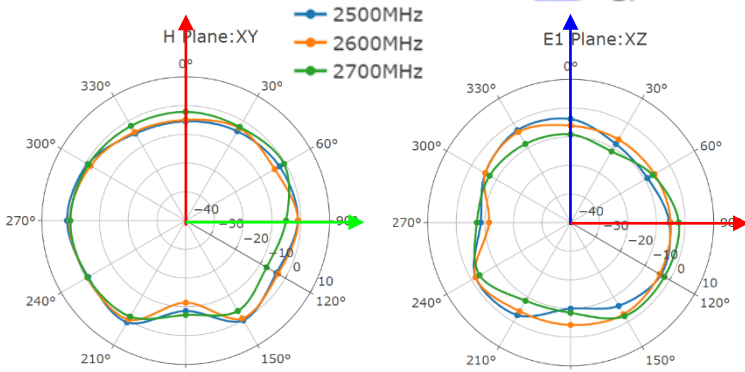
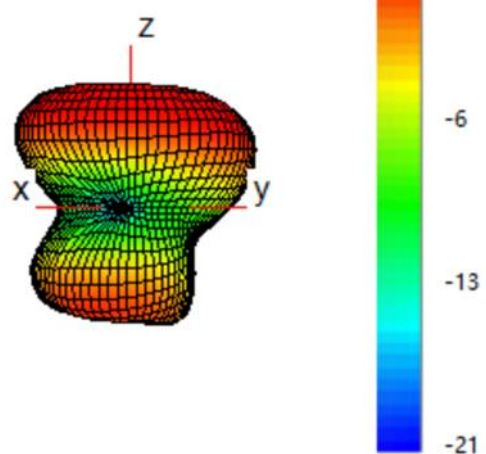
2350 MHz



2450 MHz

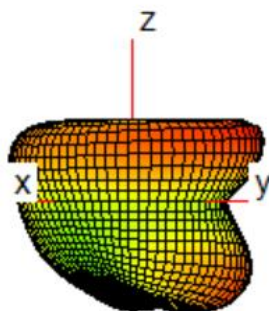


2600 MHz

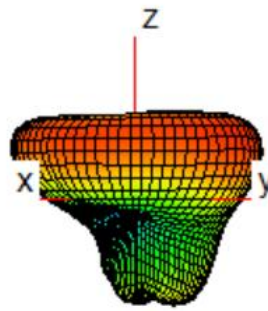


● **MH1**

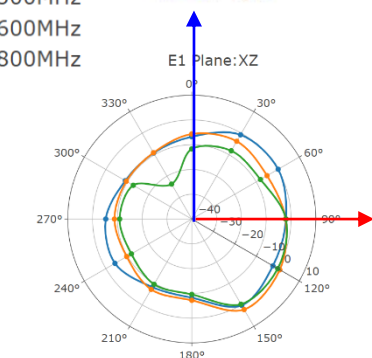
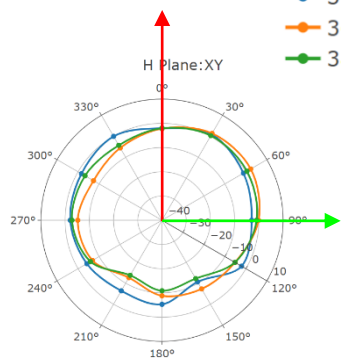
3600 MHz



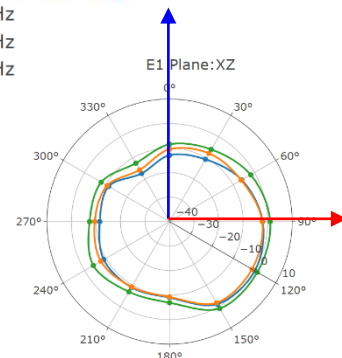
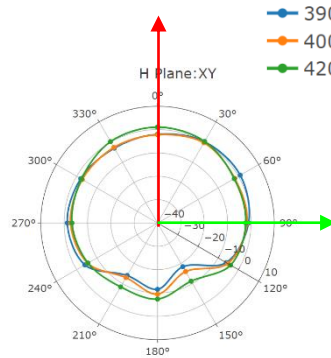
4000 MHz



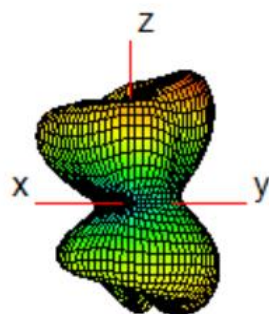
— 3300MHz
— 3600MHz
— 3800MHz



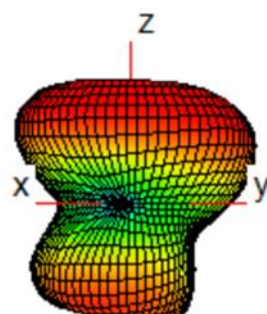
— 3900MHz
— 4000MHz
— 4200MHz



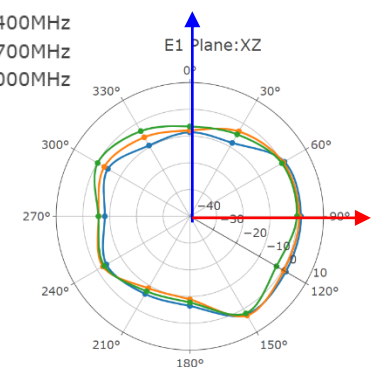
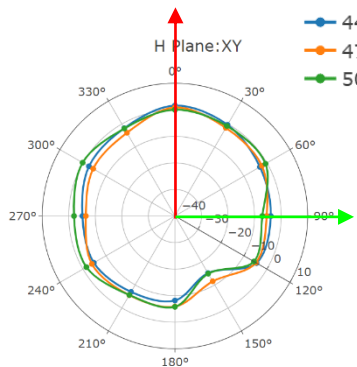
4700 MHz



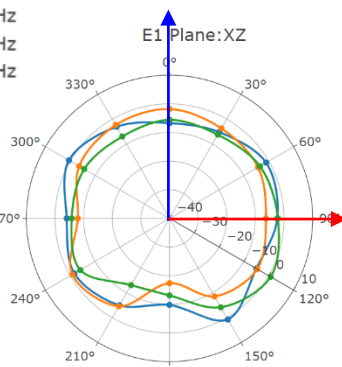
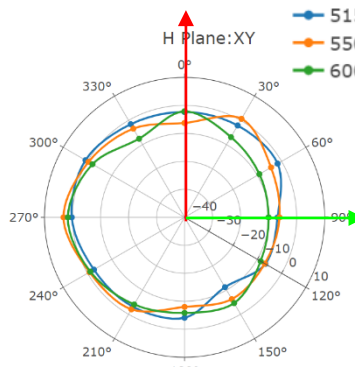
5500 MHz



— 4400MHz
— 4700MHz
— 5000MHz



— 5150MHz
— 5500MHz
— 6000MHz

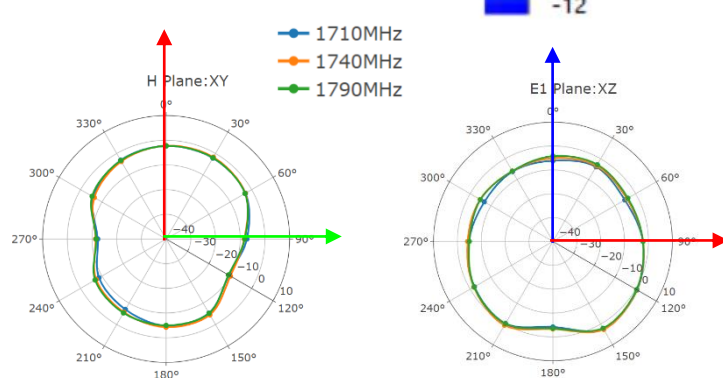
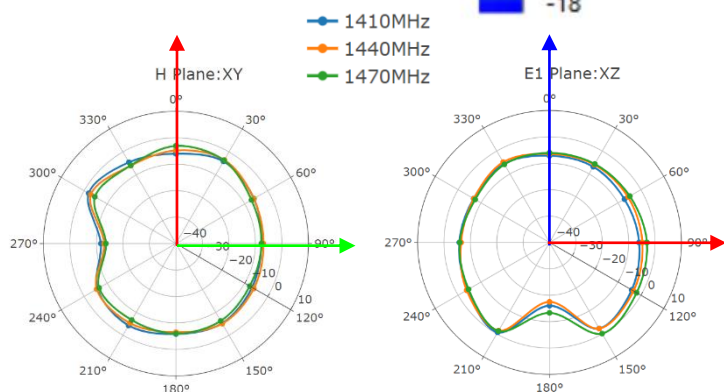
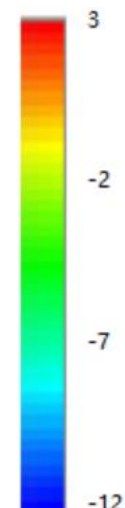


● **MH2**

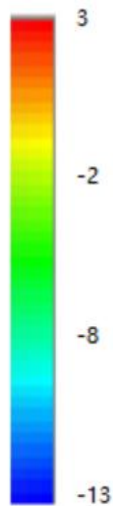
1440 MHz



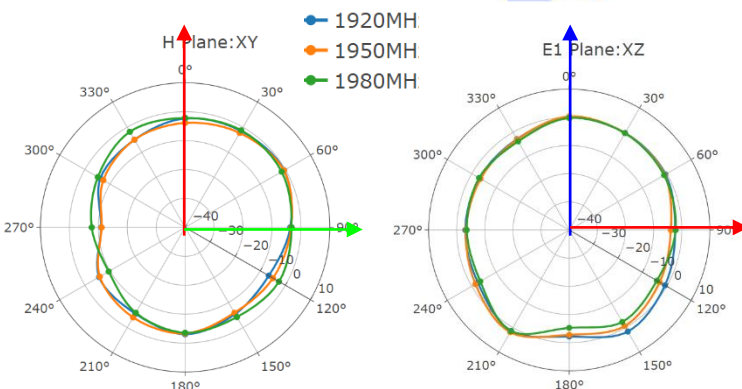
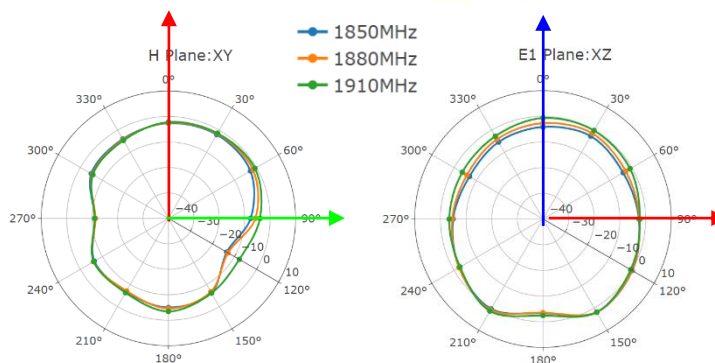
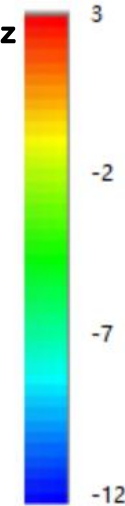
1740 MHz



1880 MHz

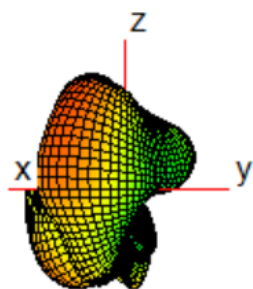


1950 MHz

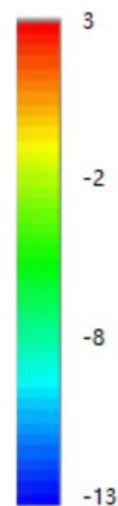
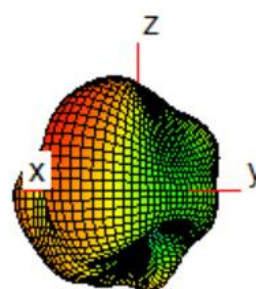


● **MH2**

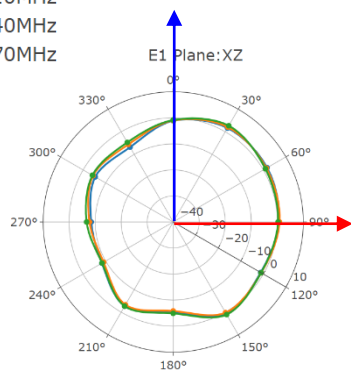
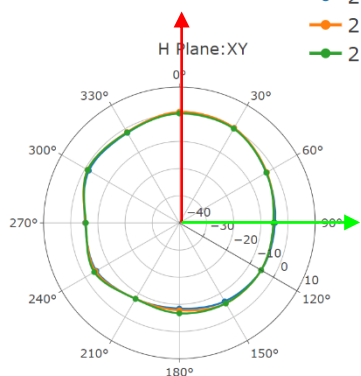
2140 MHz



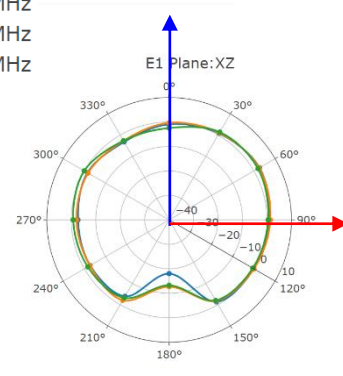
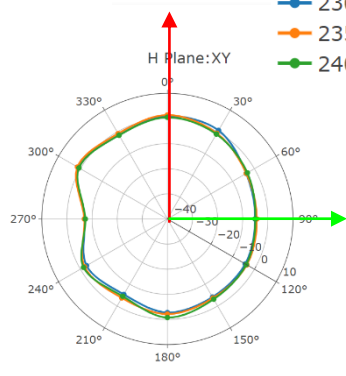
2350 MHz



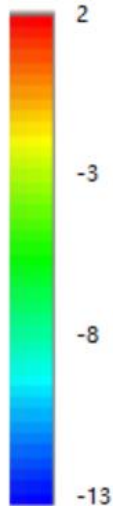
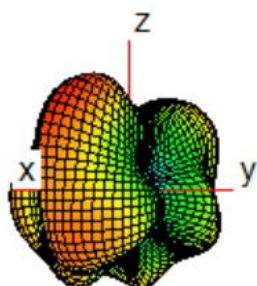
— 2110MHz
— 2140MHz
— 2170MHz



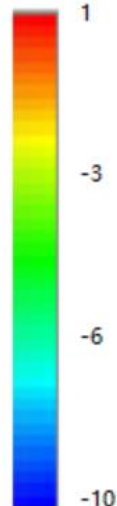
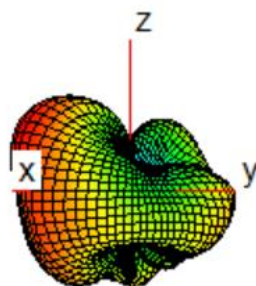
— 2300MHz
— 2350MHz
— 2400MHz



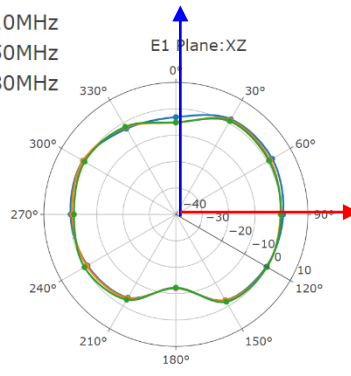
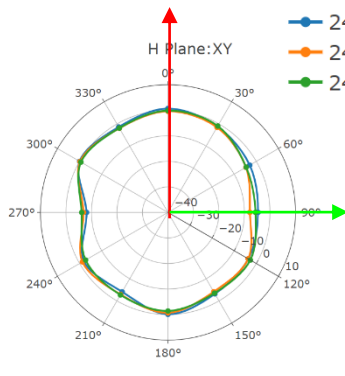
2450 MHz



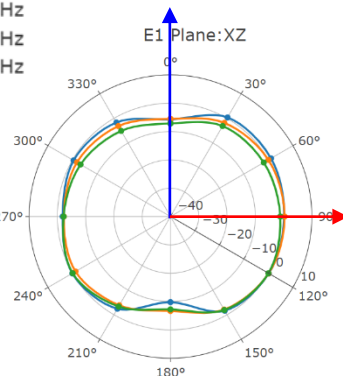
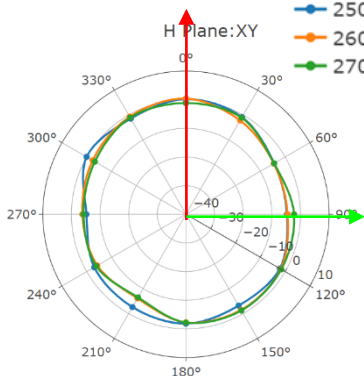
2600 MHz



— 2410MHz
— 2450MHz
— 2480MHz

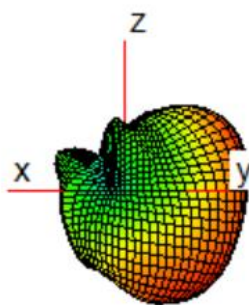


— 2500MHz
— 2600MHz
— 2700MHz

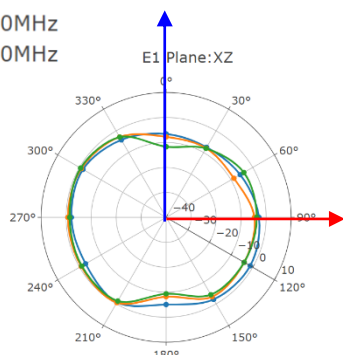
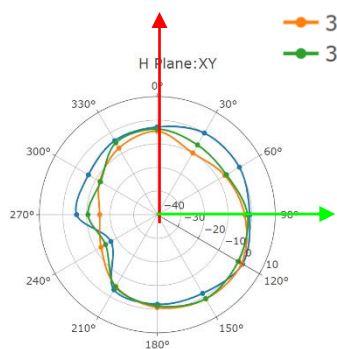


● **MH2**

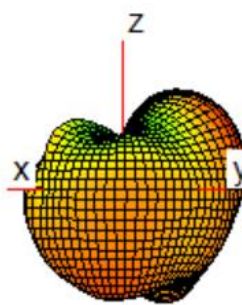
3600 MHz



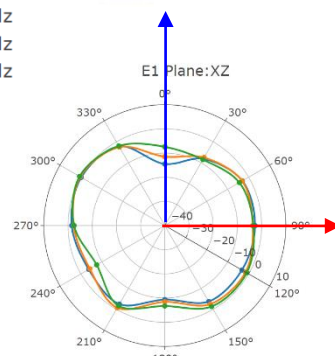
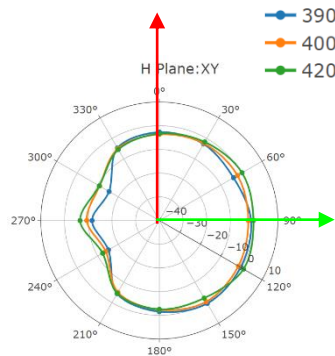
— 3300MHz
— 3600MHz
— 3800MHz



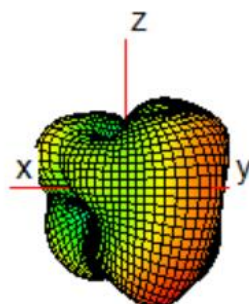
4000 MHz



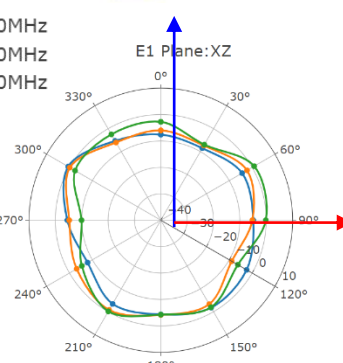
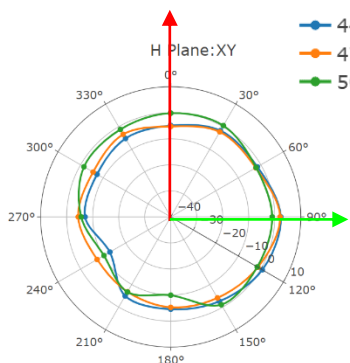
— 3900MHz
— 4000MHz
— 4200MHz



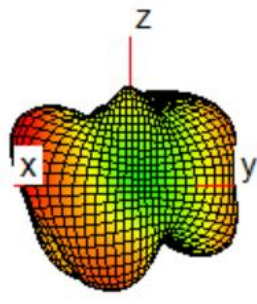
4700 MHz



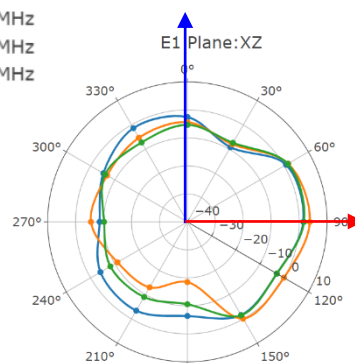
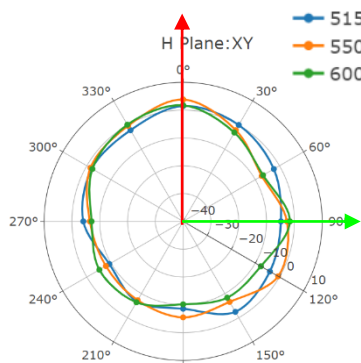
— 4400MHz
— 4700MHz
— 5000MHz



5500 MHz

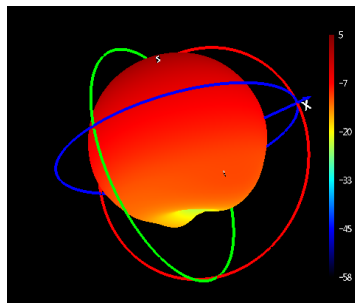


— 5150MHz
— 5500MHz
— 6000MHz

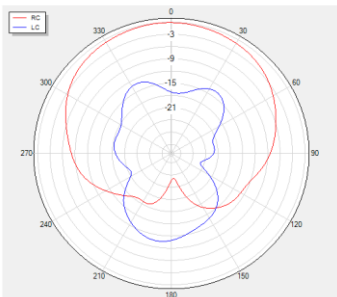


● **GNSS**

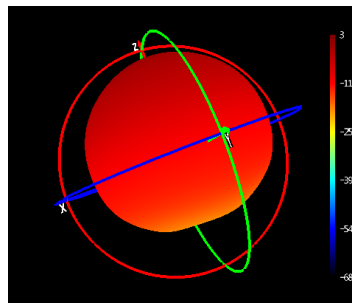
1176 MHz



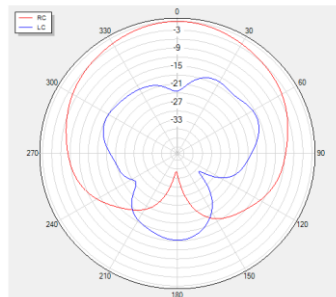
Phi=0 freq=1176MHz



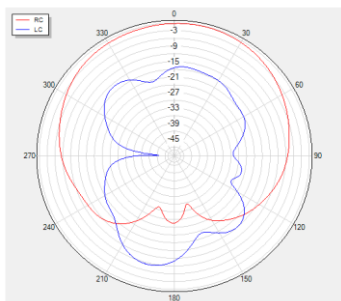
1561 MHz



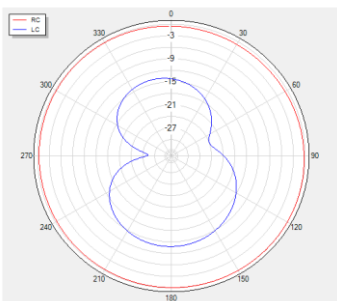
Phi=0 freq=1561MHz



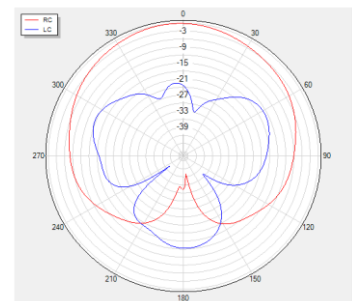
Phi=90 freq=1176MHz



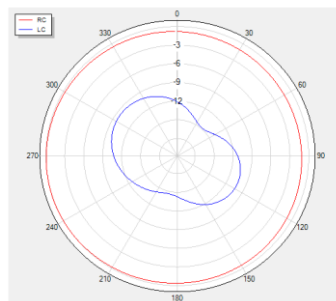
Theta=90 freq=1176MHz



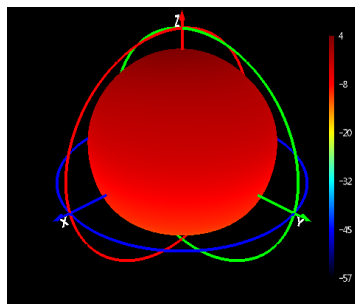
Phi=90 freq=1561MHz



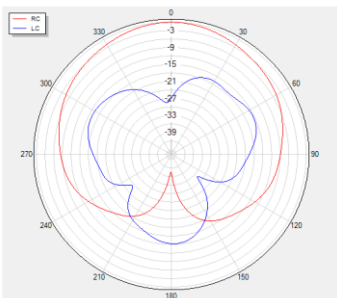
Theta=90 freq=1561MHz



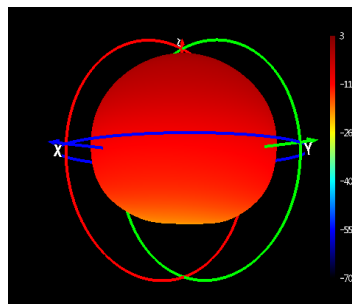
1575 MHz



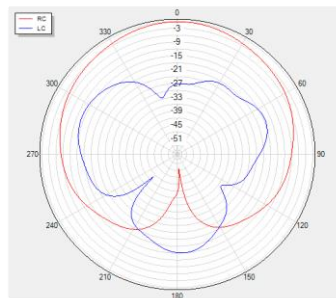
Phi=0 freq=1575MHz



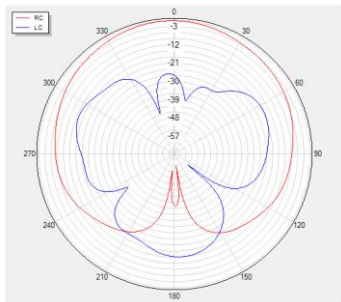
1602 MHz



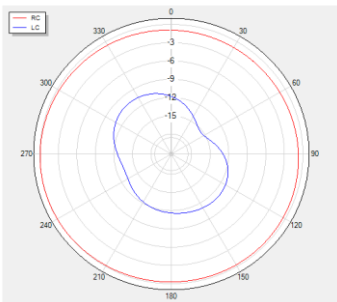
Phi=0 freq=1602MHz



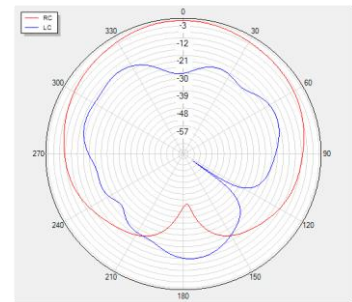
Phi=90 freq=1575MHz



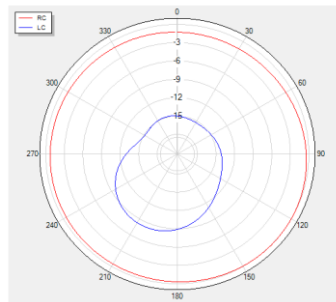
Theta=90 freq=1575MHz

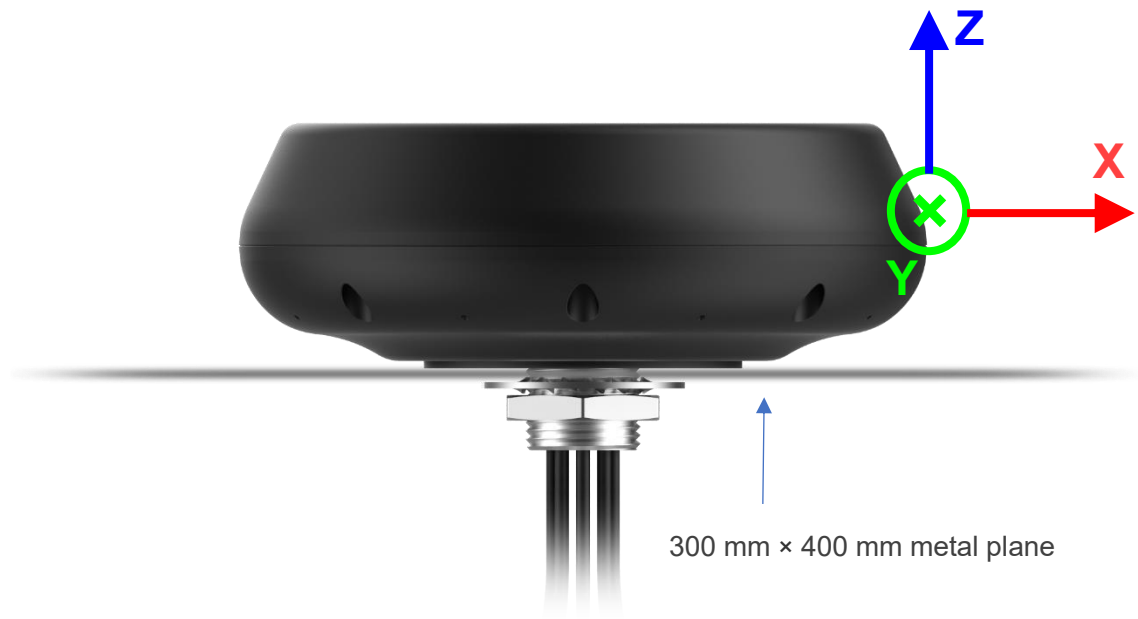


Phi=90 freq=1602MHz



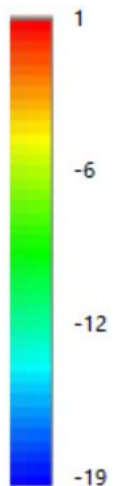
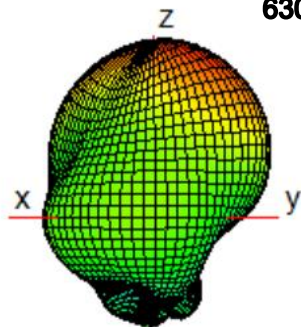
Theta=90 freq=1602MHz



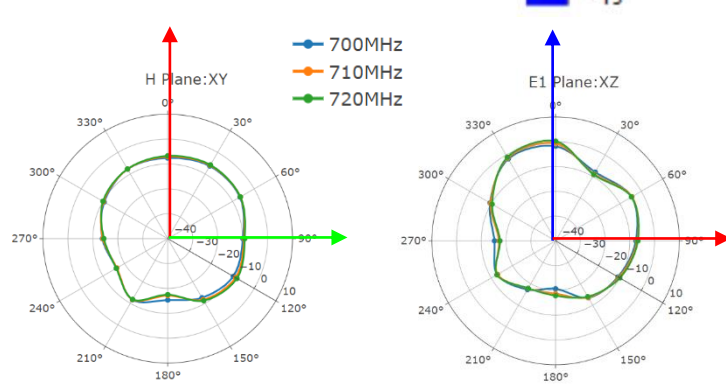
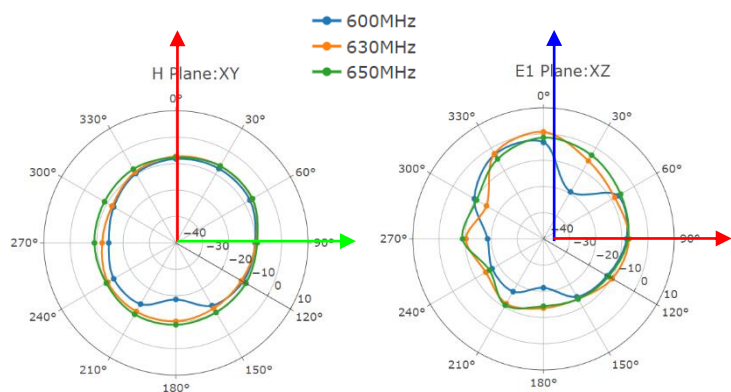
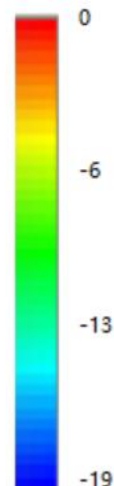
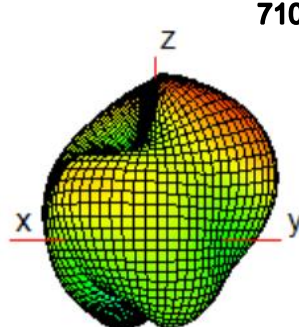
3.2.5.2. Test Status: On 300 mm × 400 mm Metal Plane

● **LMH1**

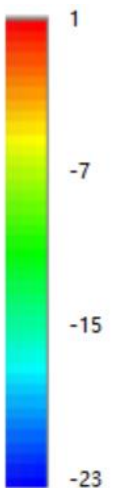
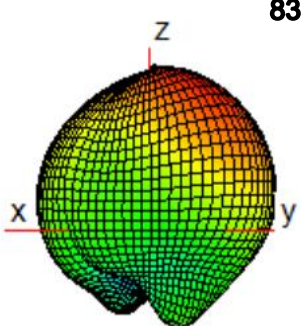
630 MHz



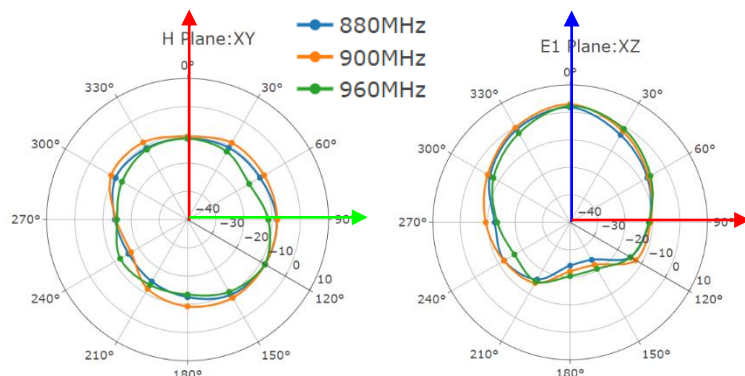
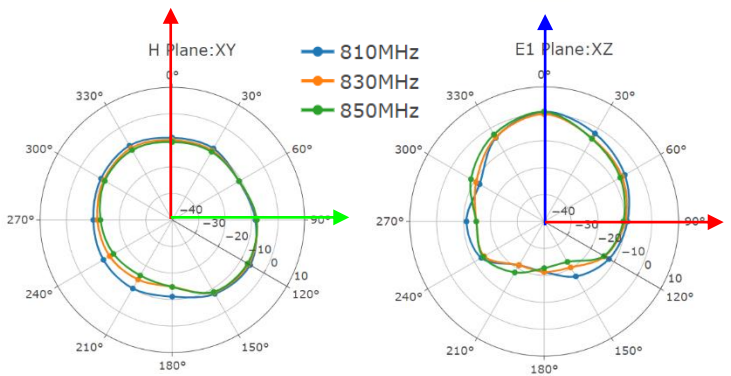
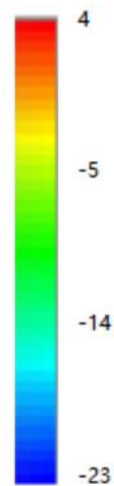
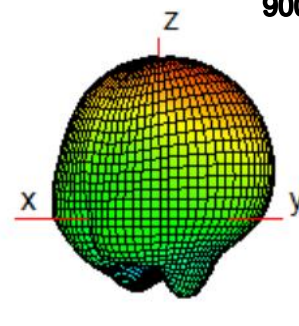
710 MHz



830 MHz

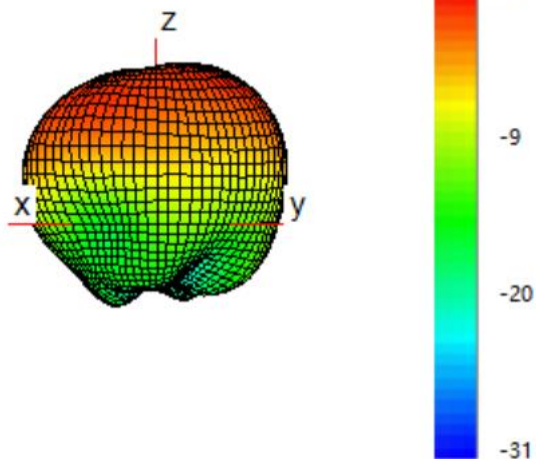


900 MHz

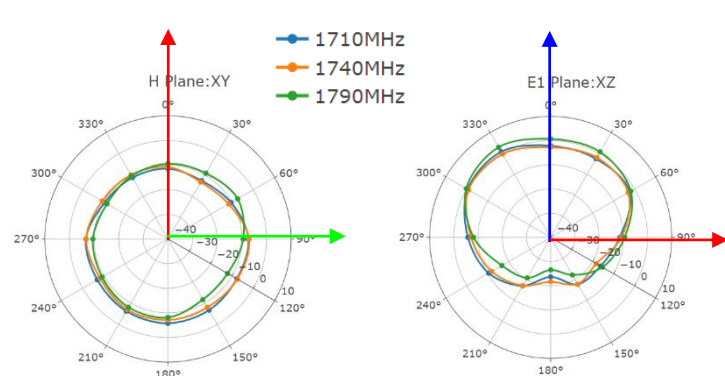
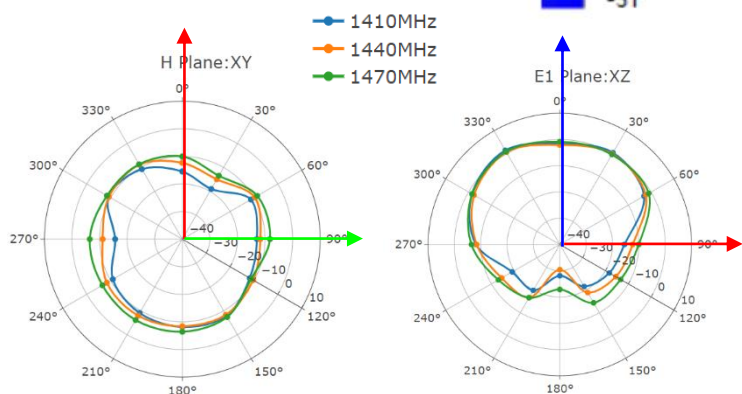
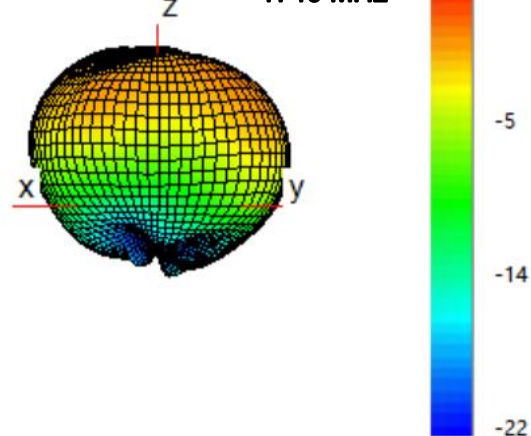


● **LMH1**

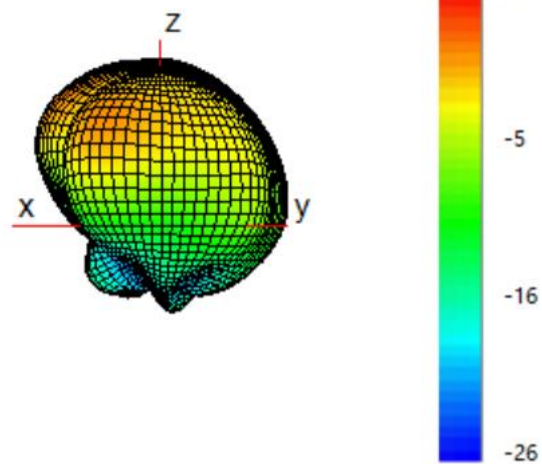
1440 MHz



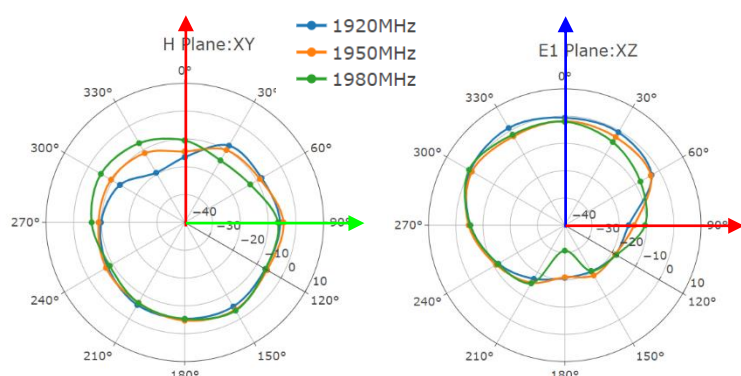
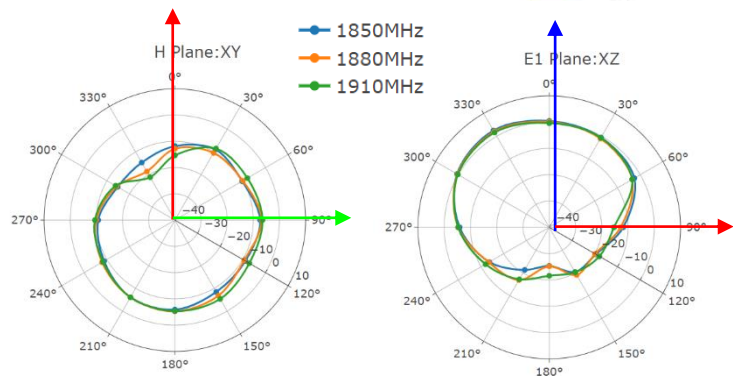
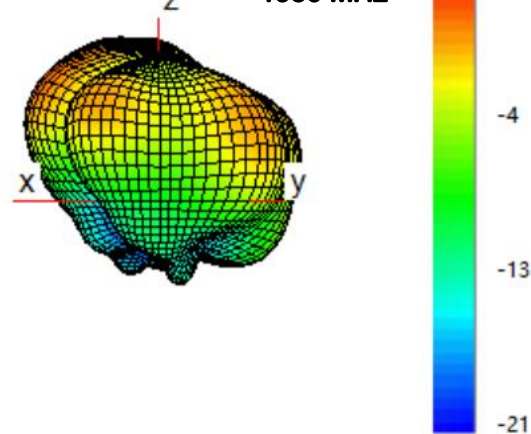
1740 MHz



1880 MHz



1950 MHz

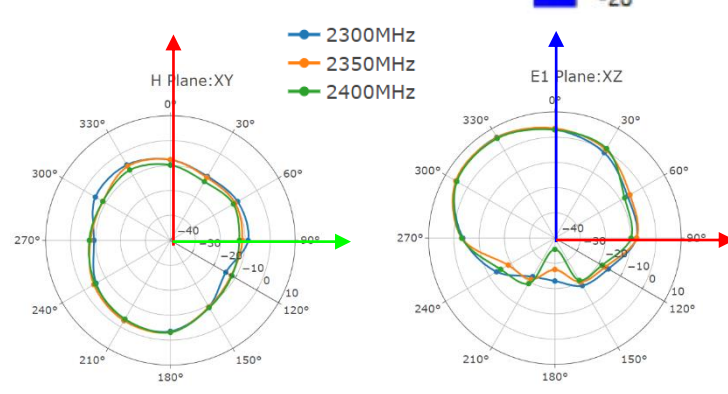
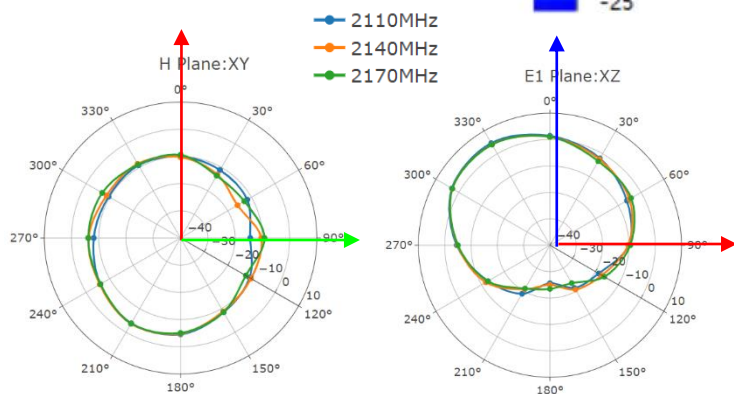
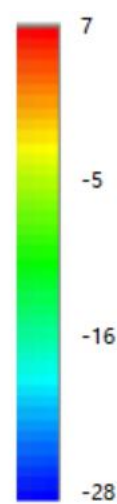


● **LMH1**

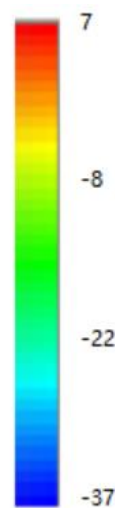
2140MHz



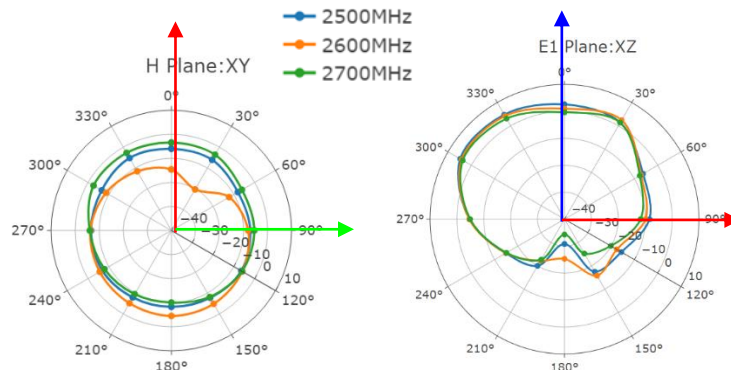
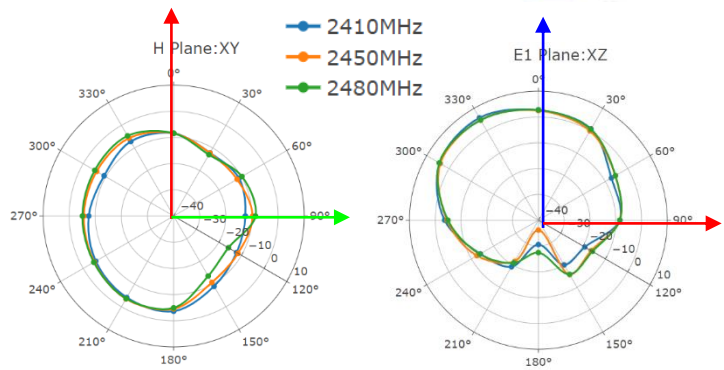
2350 MHz



2450 MHz

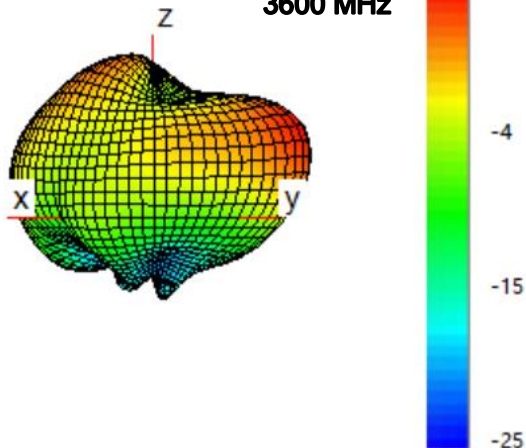


2600 MHz

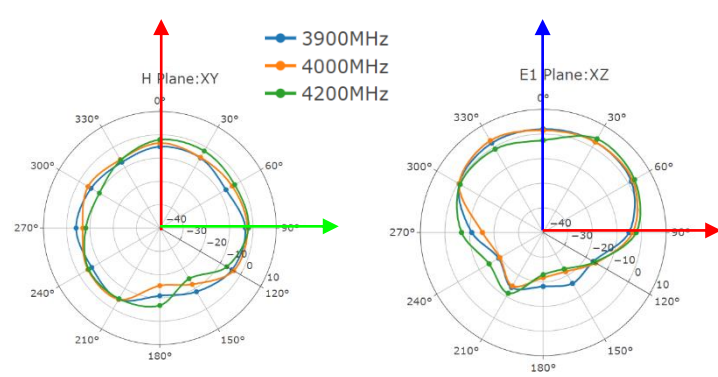
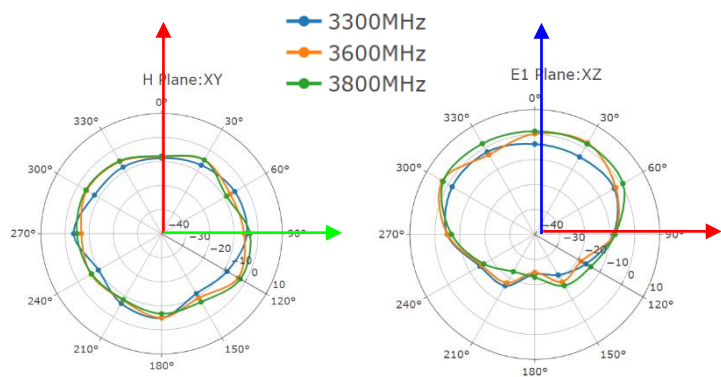
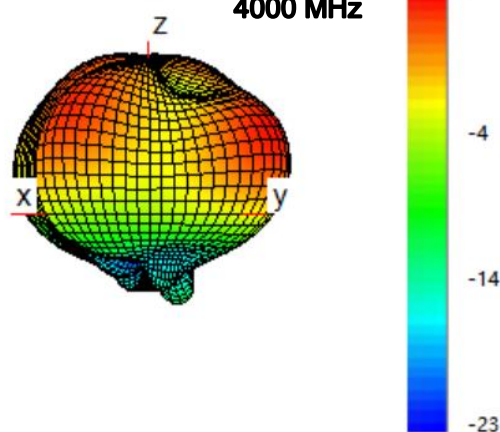


● **LMH1**

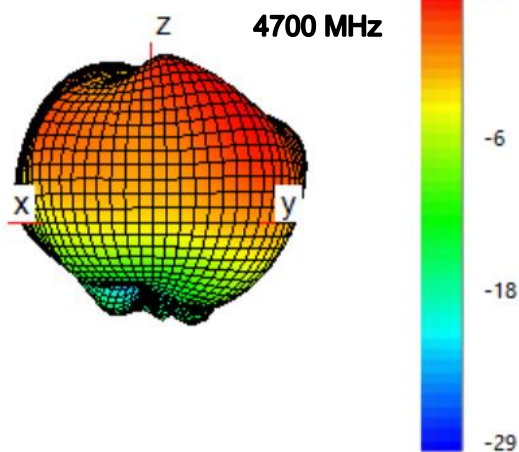
3600 MHz



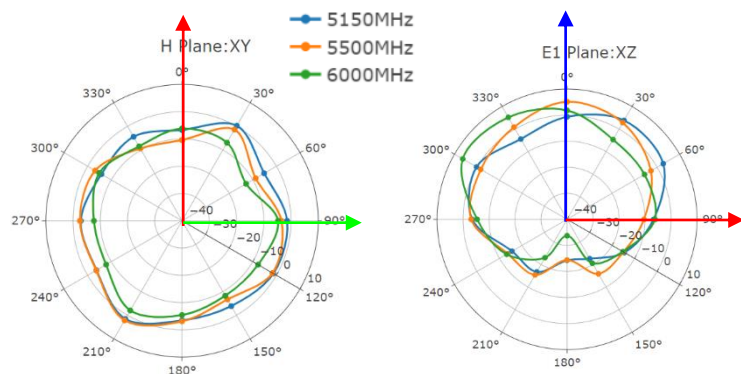
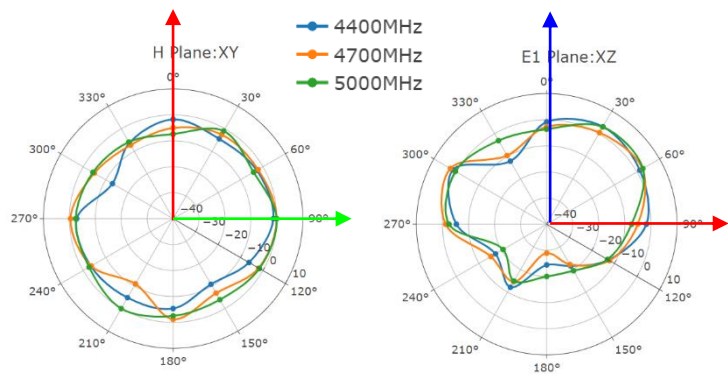
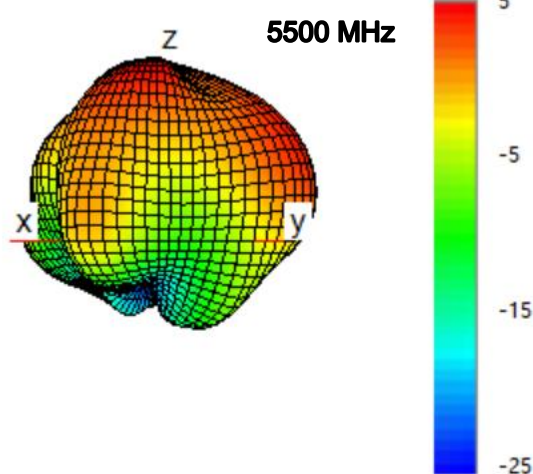
4000 MHz



4700 MHz

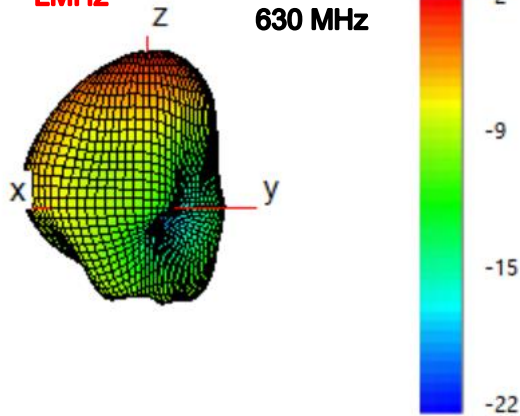


5500 MHz

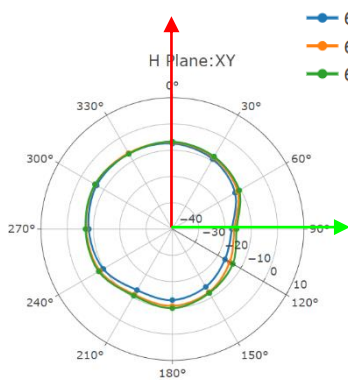
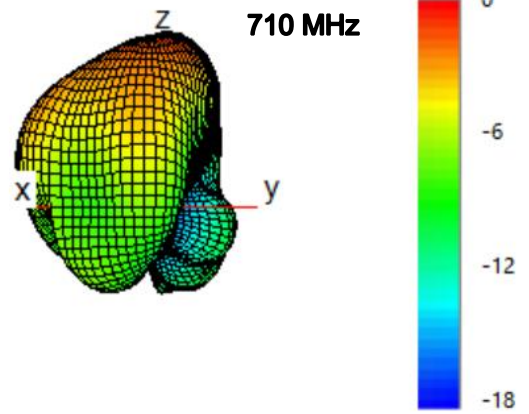


● **LMH2**

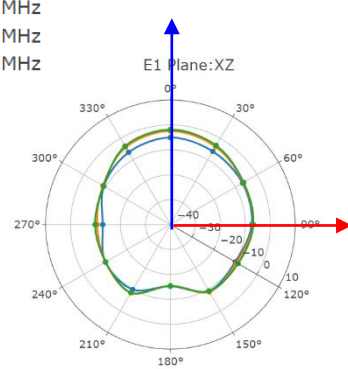
630 MHz



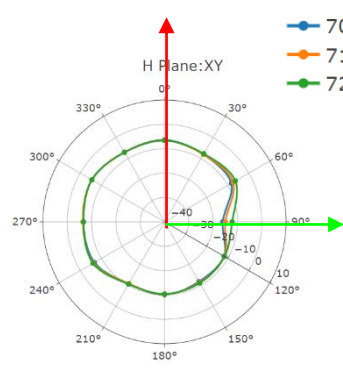
710 MHz



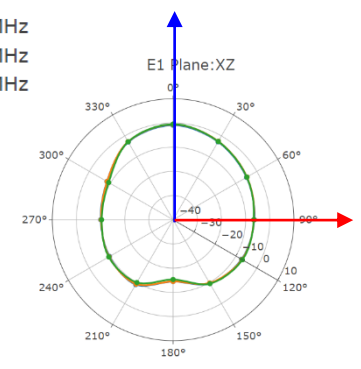
— 600MHz
— 630MHz
— 650MHz



— 600MHz
— 630MHz
— 650MHz

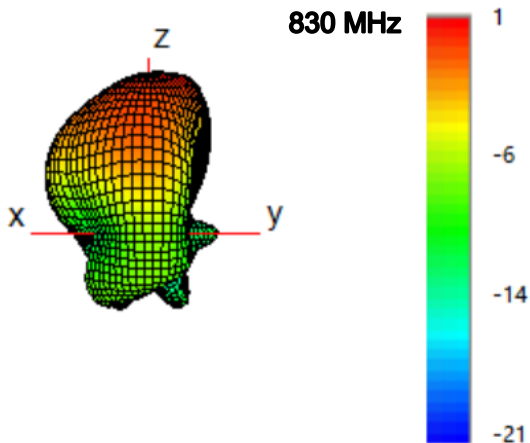


— 700MHz
— 710MHz
— 720MHz

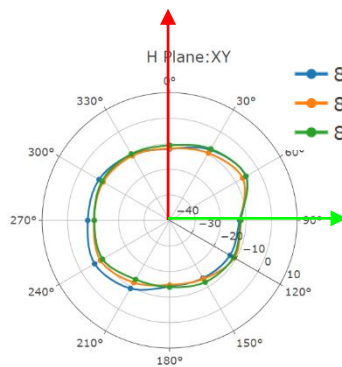
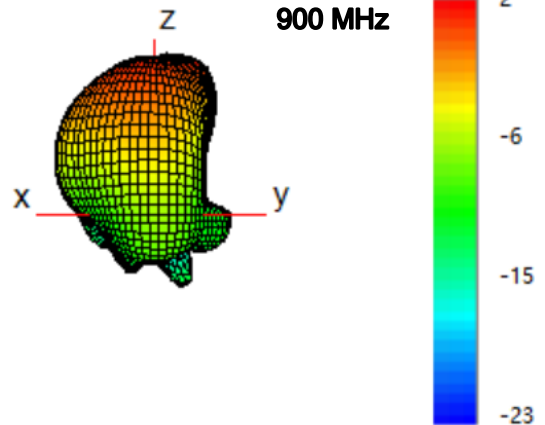


— 700MHz
— 710MHz
— 720MHz

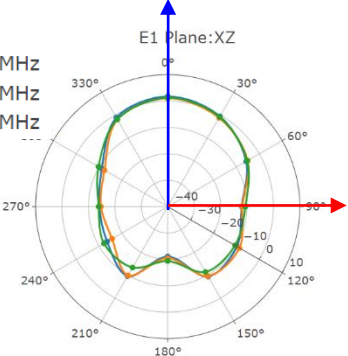
830 MHz



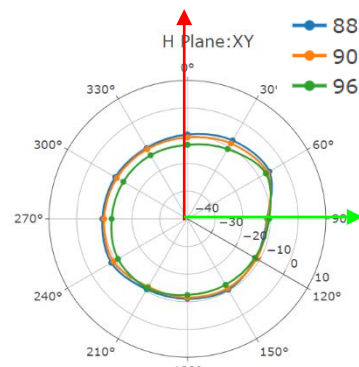
900 MHz



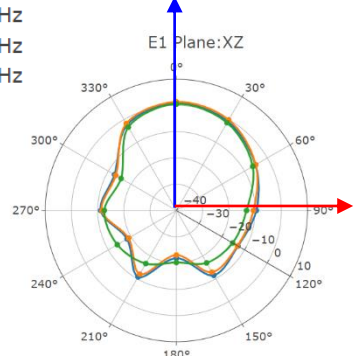
— 810MHz
— 830MHz
— 850MHz



— 810MHz
— 830MHz
— 850MHz



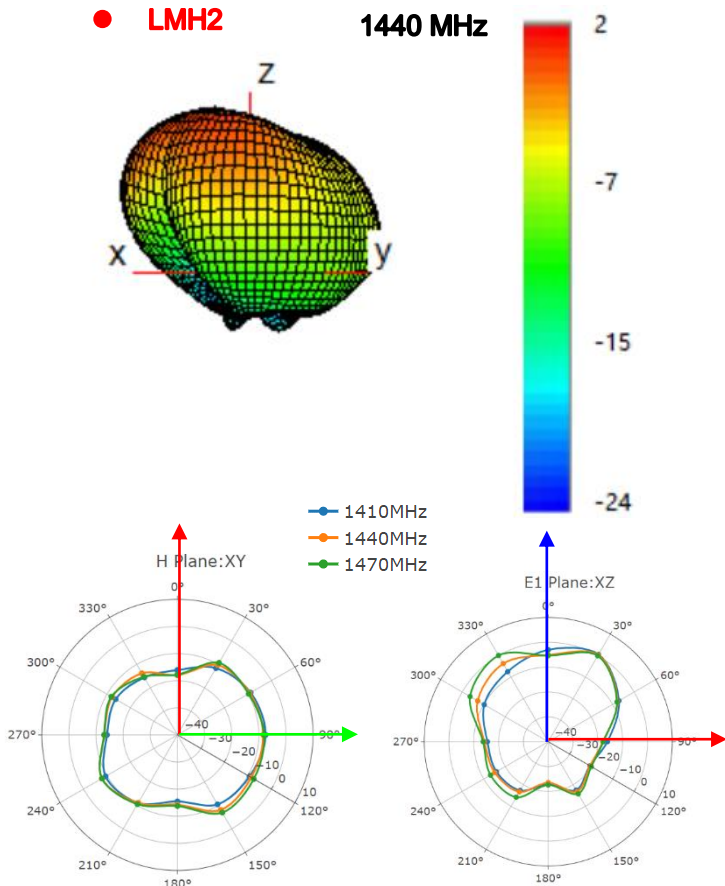
— 880MHz
— 900MHz
— 960MHz



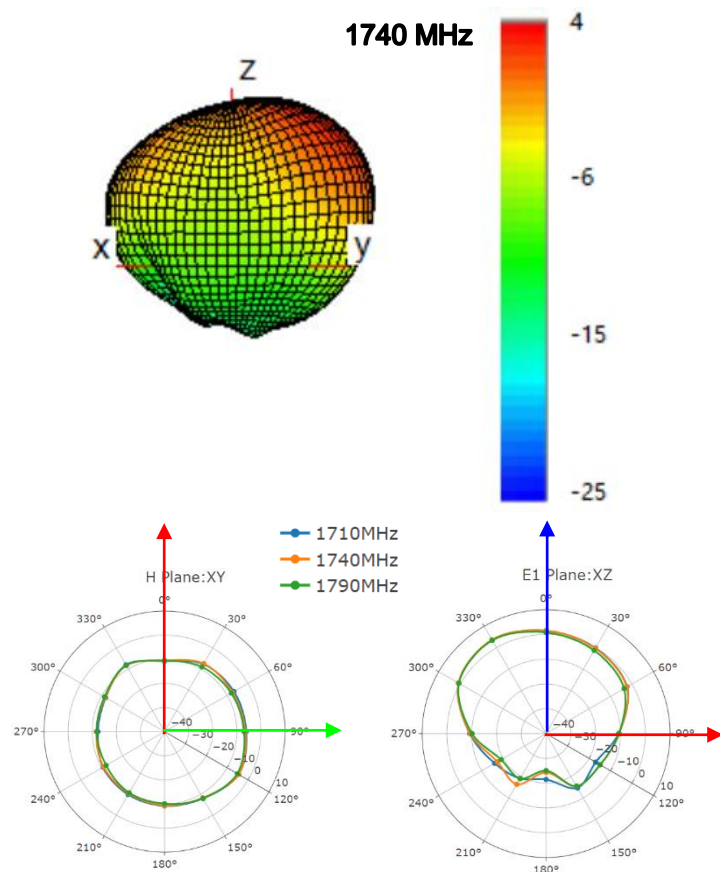
— 880MHz
— 900MHz
— 960MHz

● **LMH2**

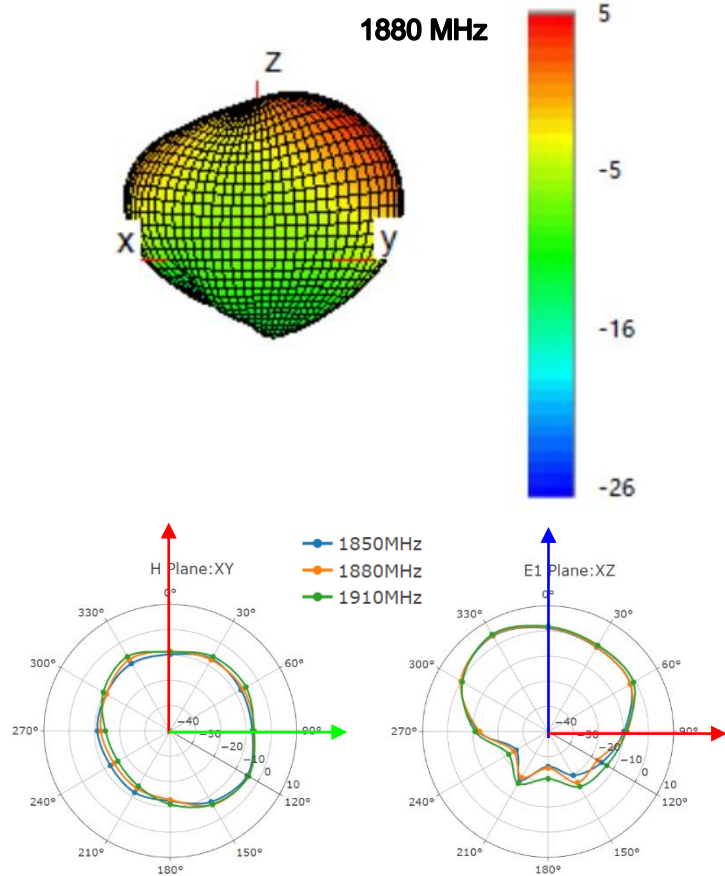
1440 MHz



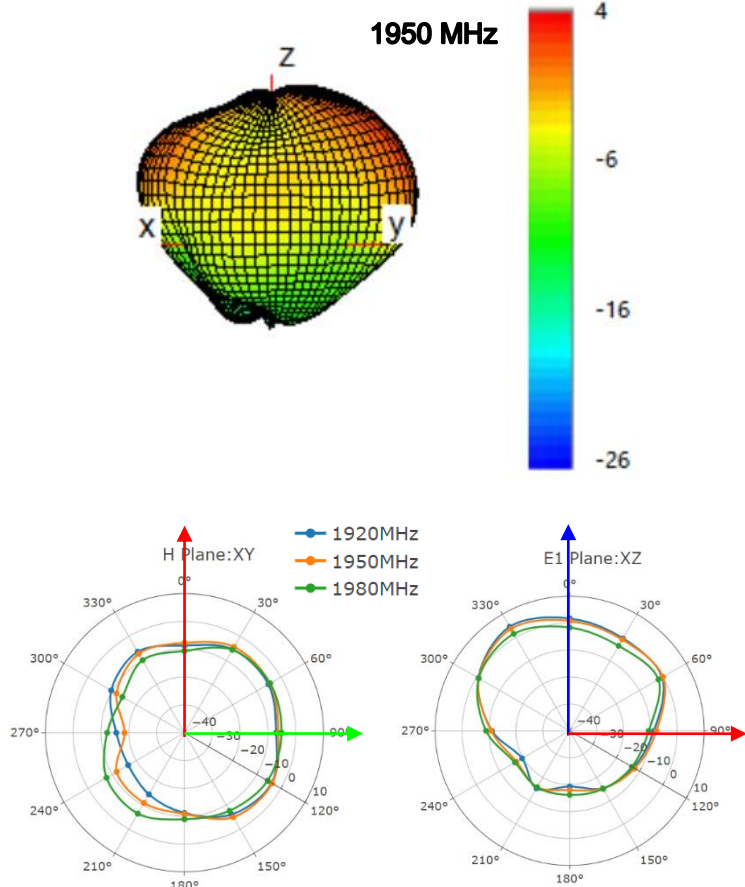
1740 MHz



1880 MHz

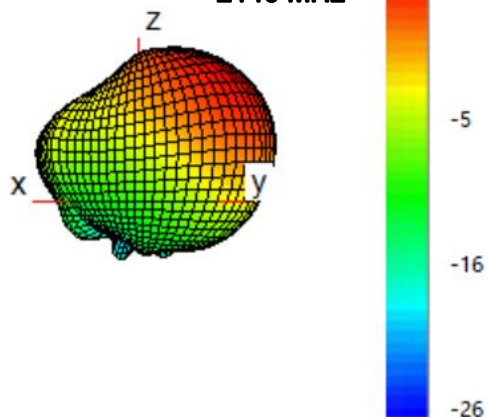


1950 MHz

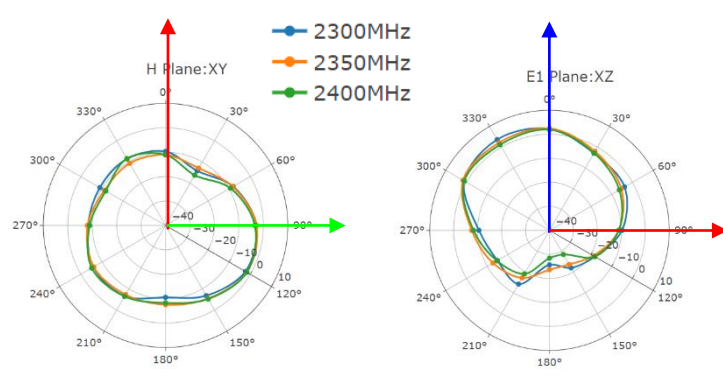
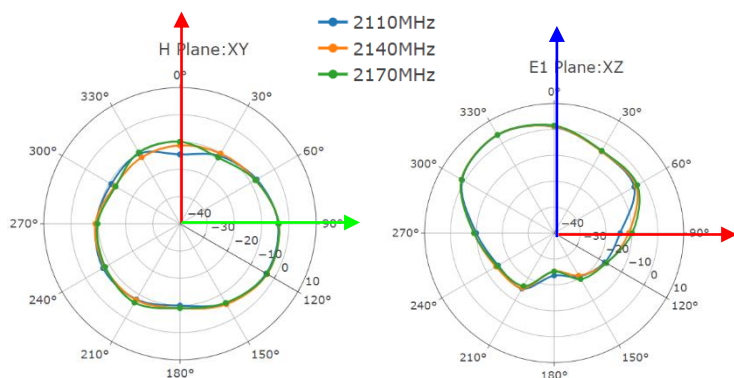
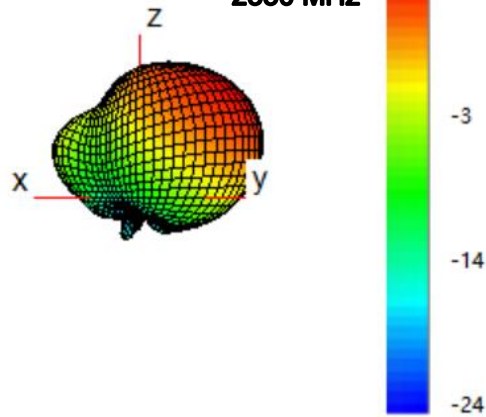


● **LMH2**

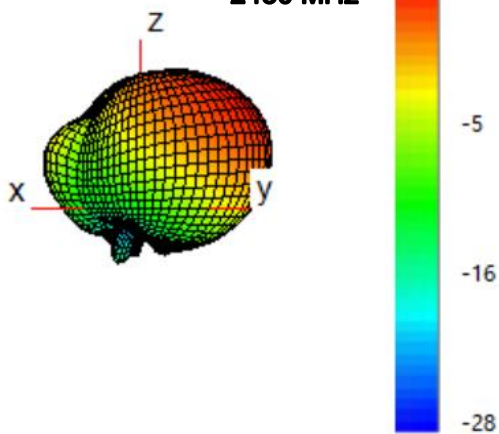
2140 MHz



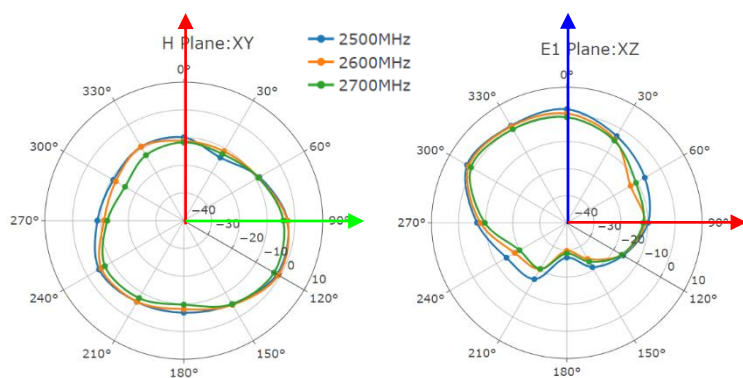
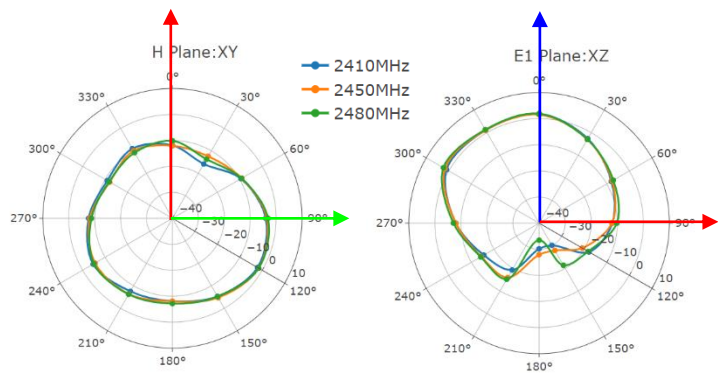
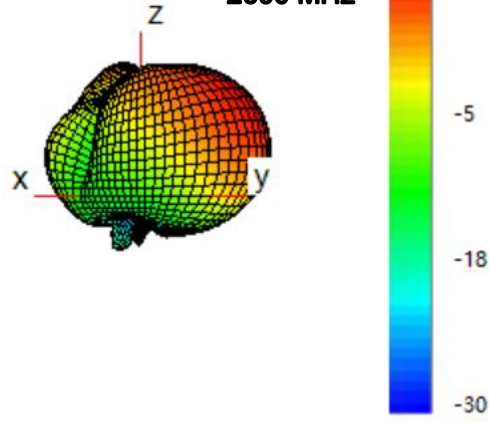
2350 MHz



2450 MHz

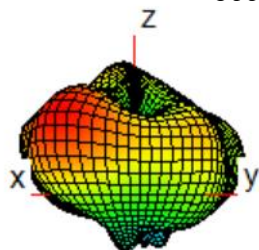


2600 MHz

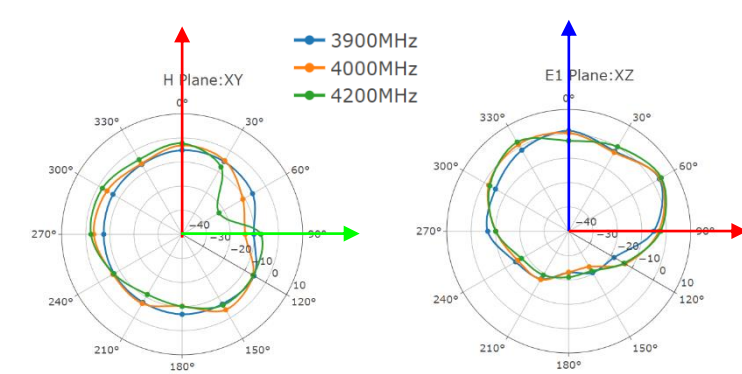
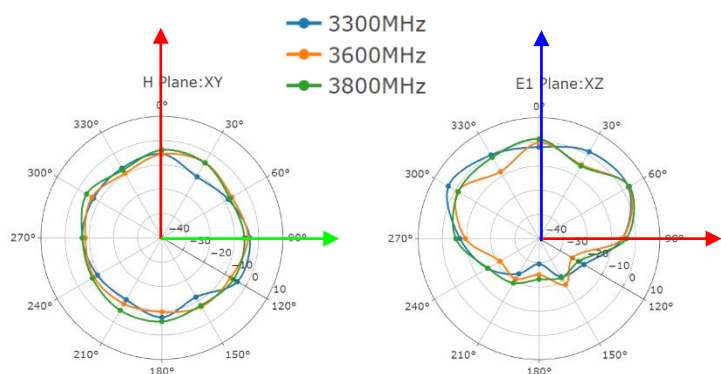
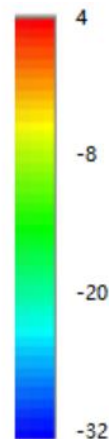
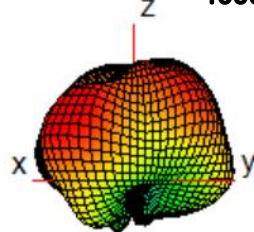


● **LMH2**

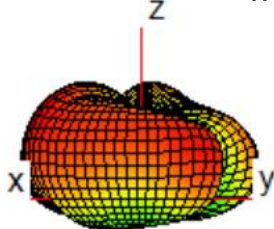
3600 MHz



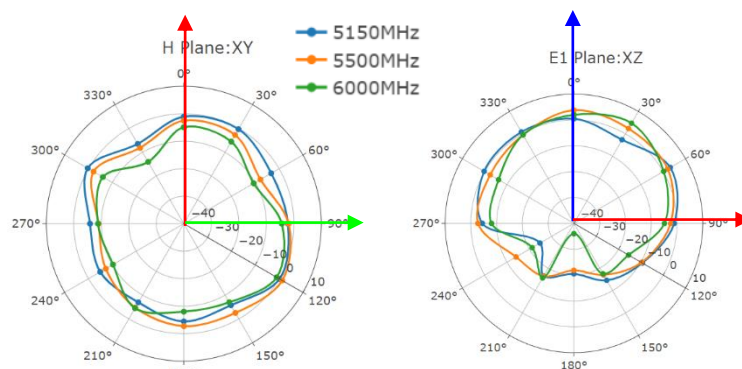
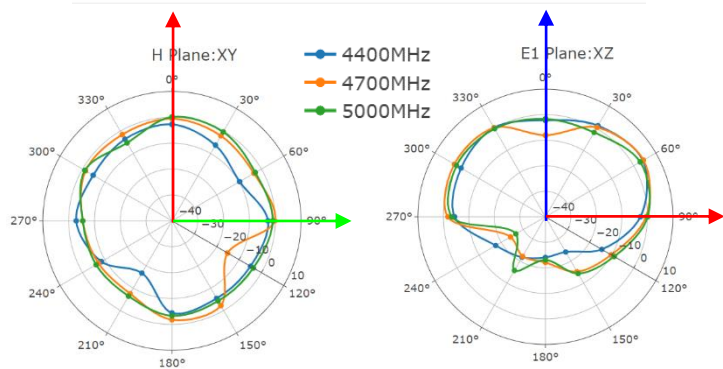
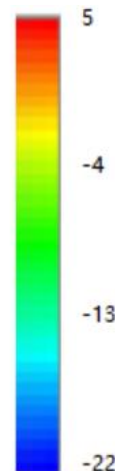
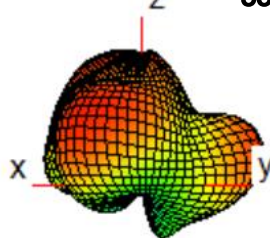
4000 MHz



4700 MHz

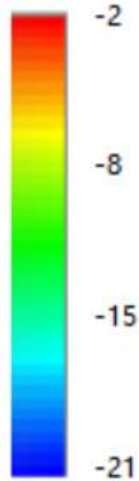


5500 MHz

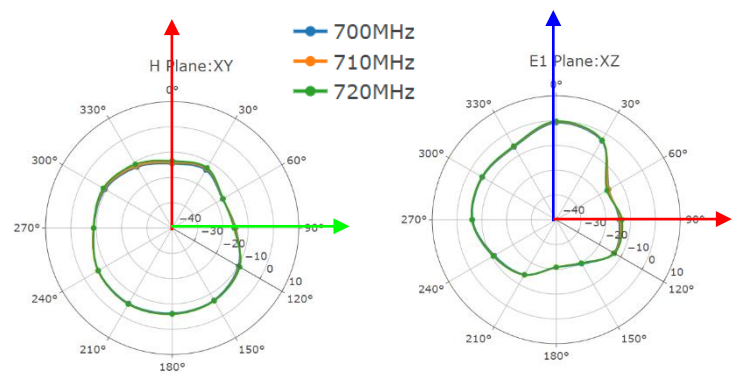
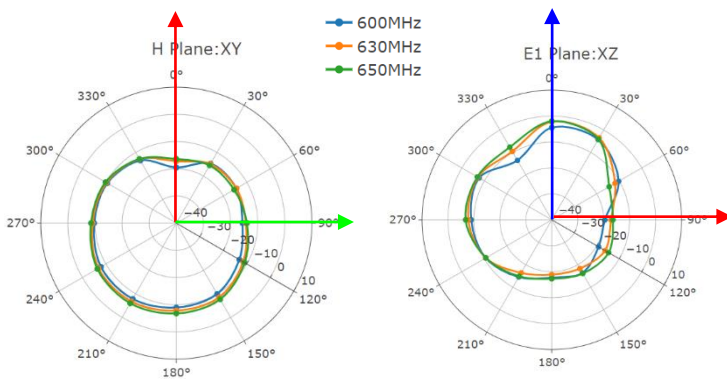
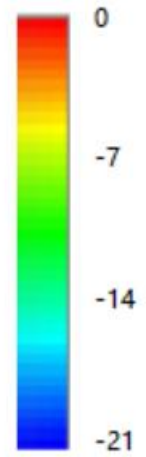


● **LMH3**

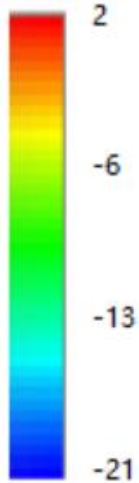
630 MHz



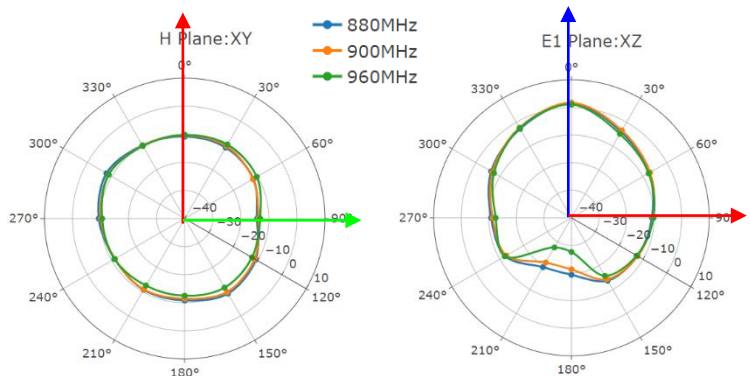
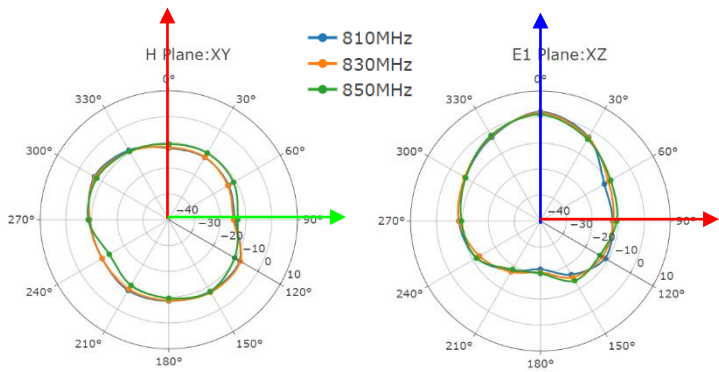
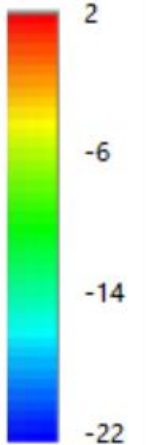
710 MHz



830 MHz

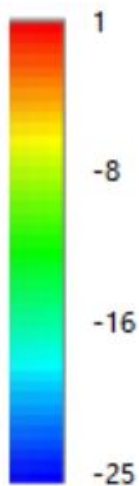


900 MHz

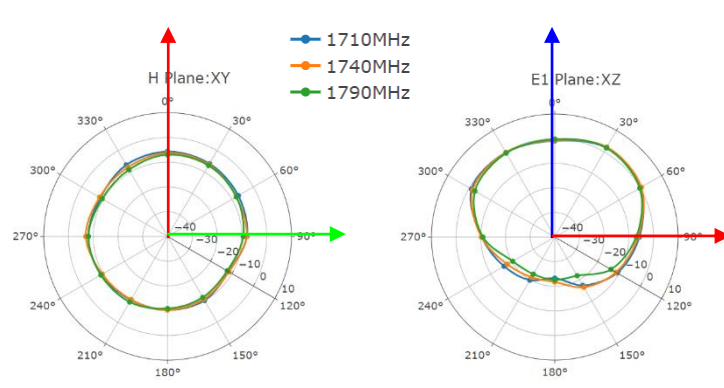
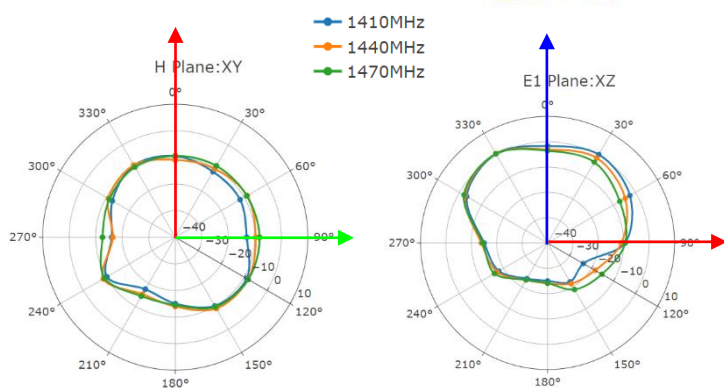
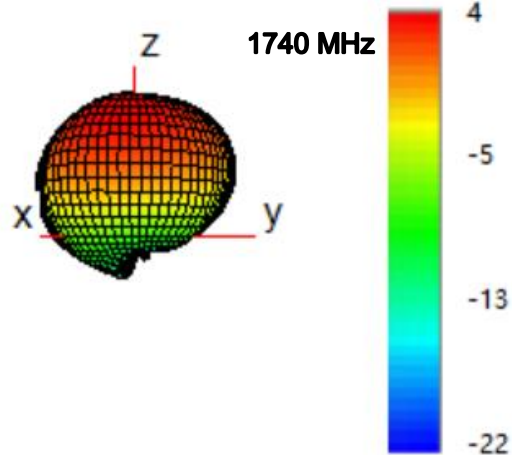


● **LMH3**

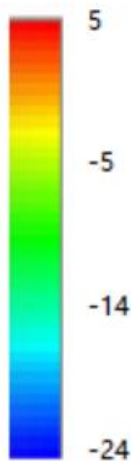
1440 MHz



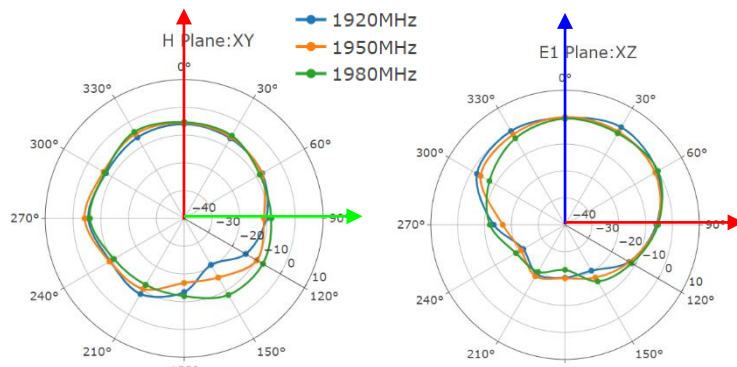
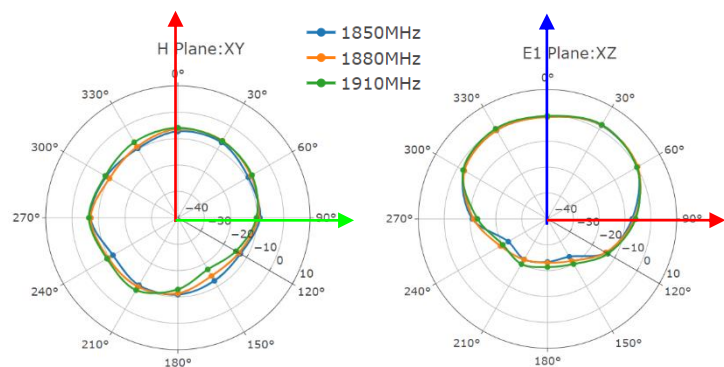
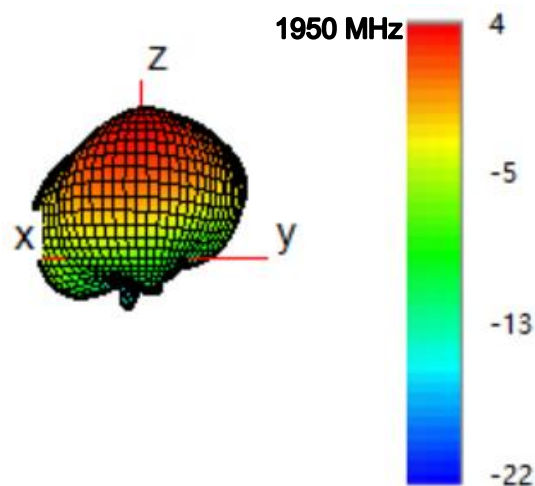
1740 MHz



1880 MHz

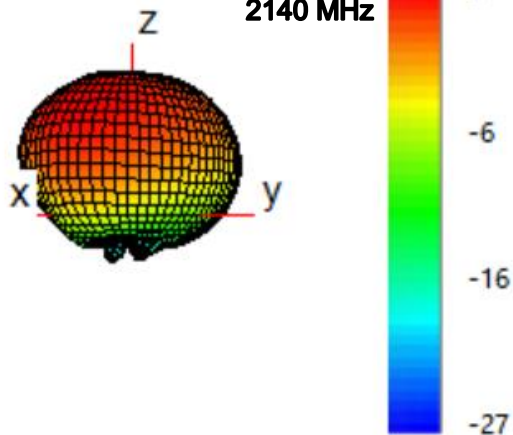


1950 MHz

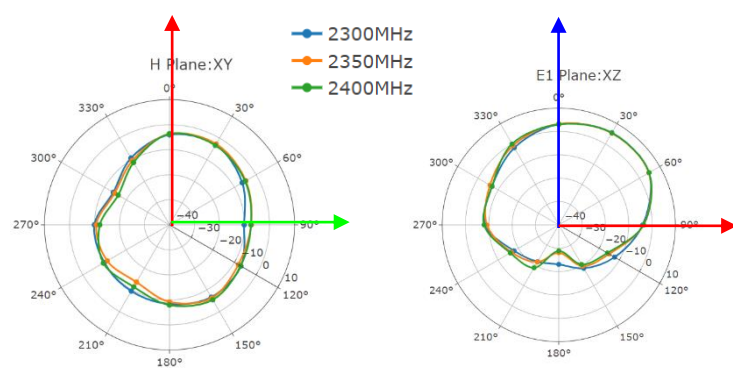
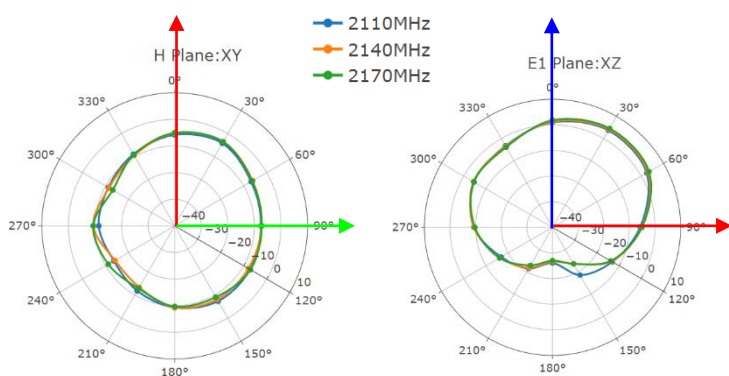
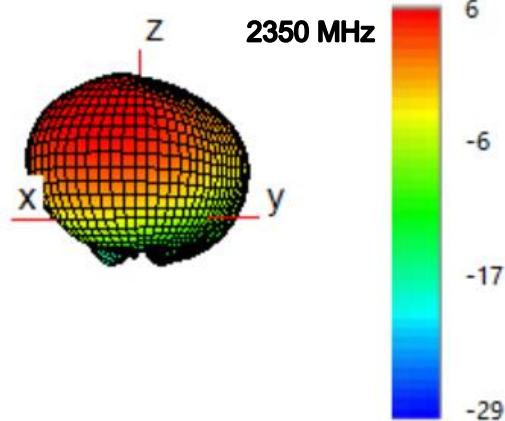


● **LMH3**

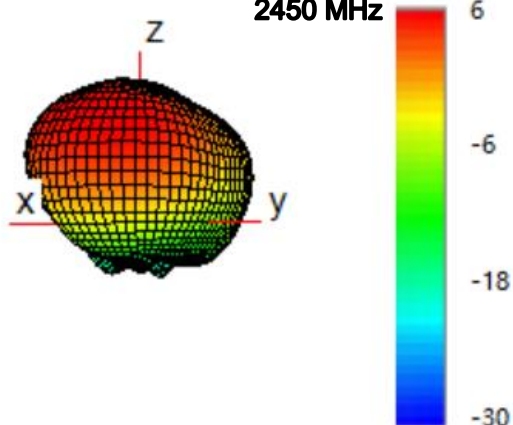
2140 MHz



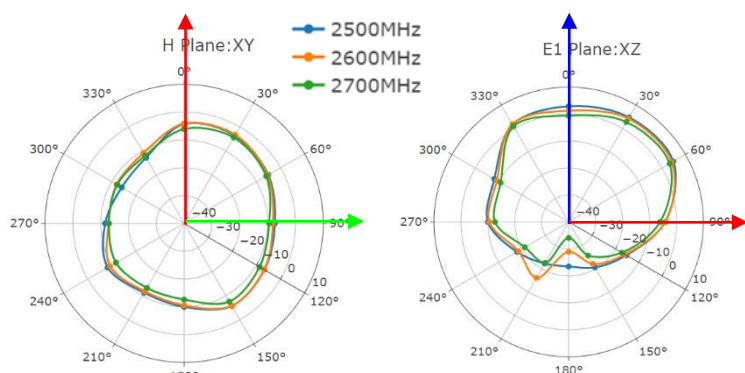
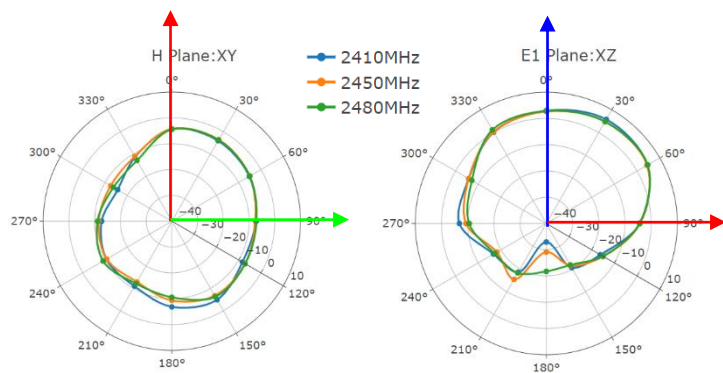
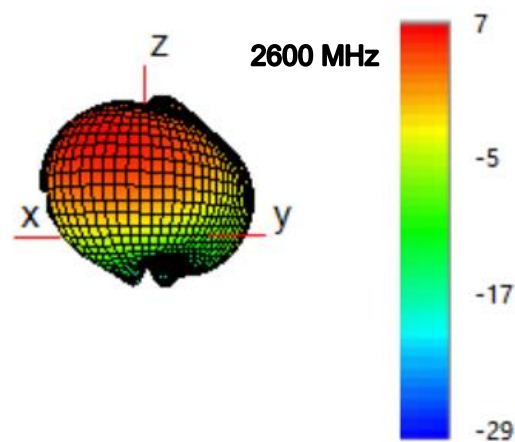
2350 MHz



2450 MHz

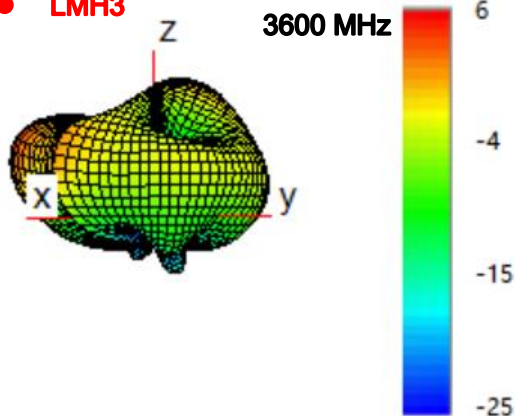


2600 MHz

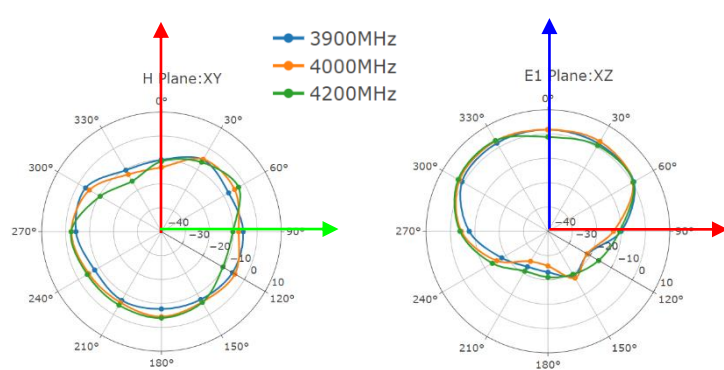
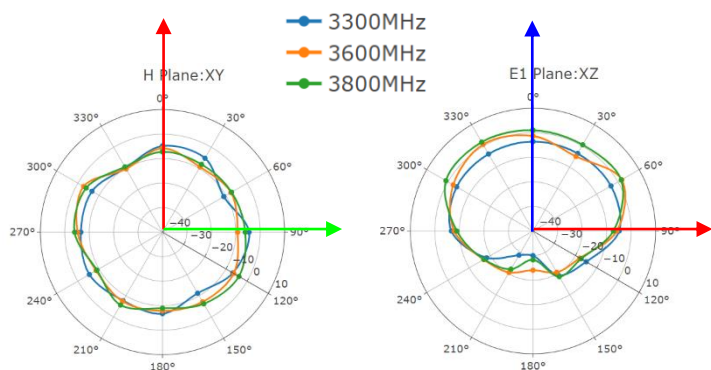
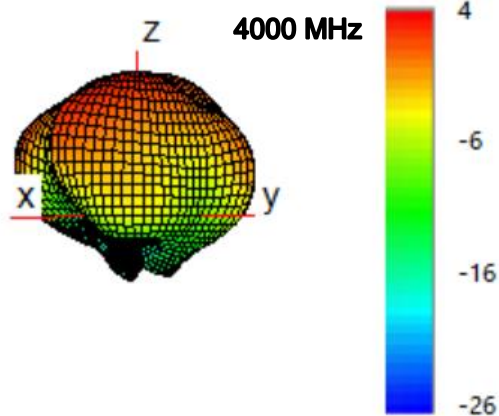


● **LMH3**

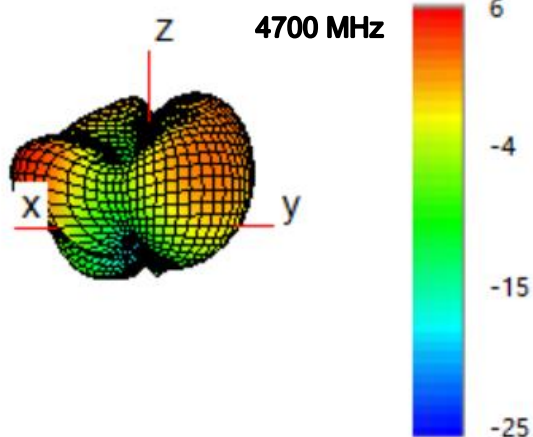
3600 MHz



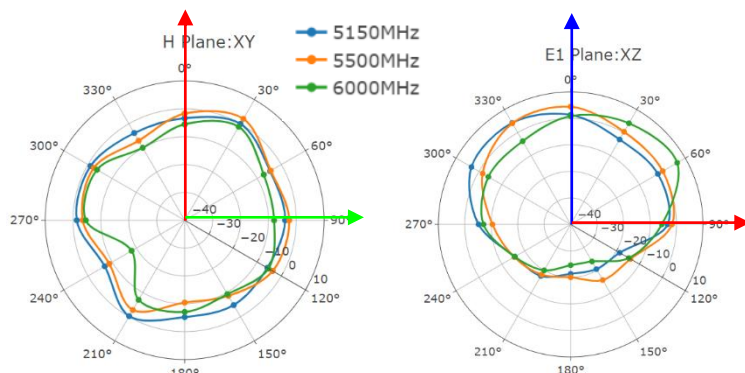
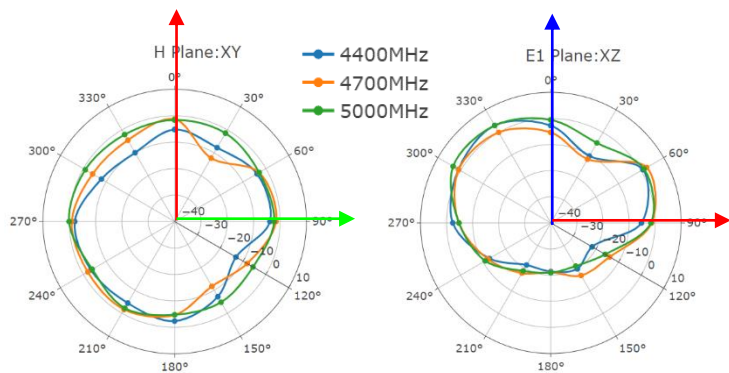
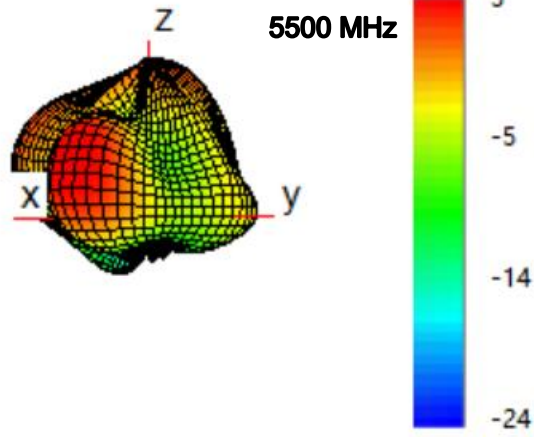
4000 MHz

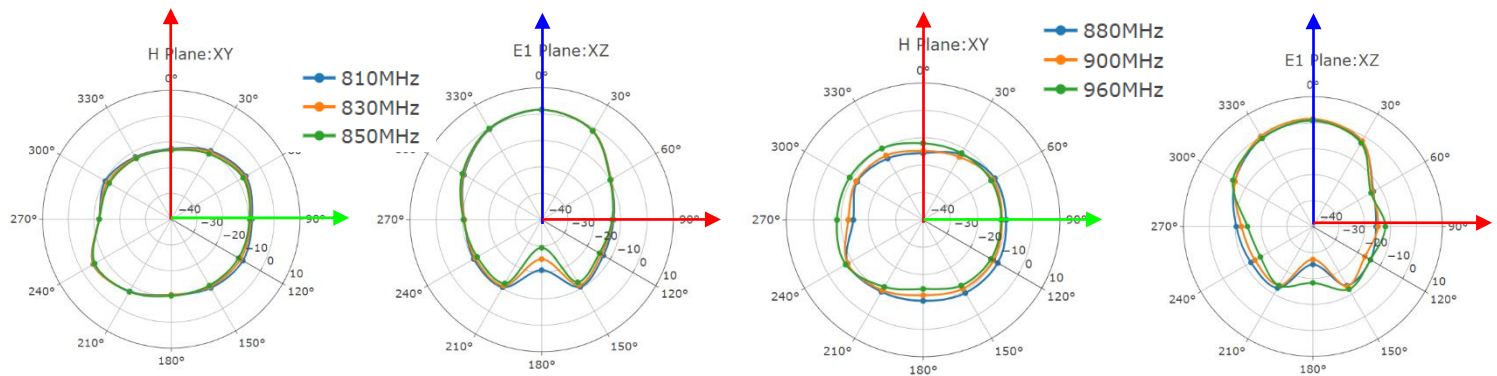
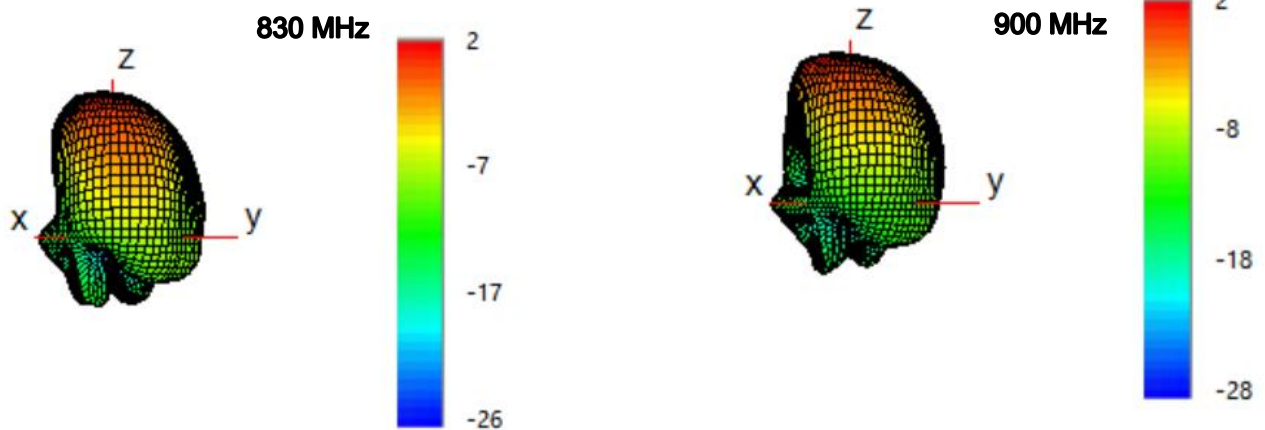
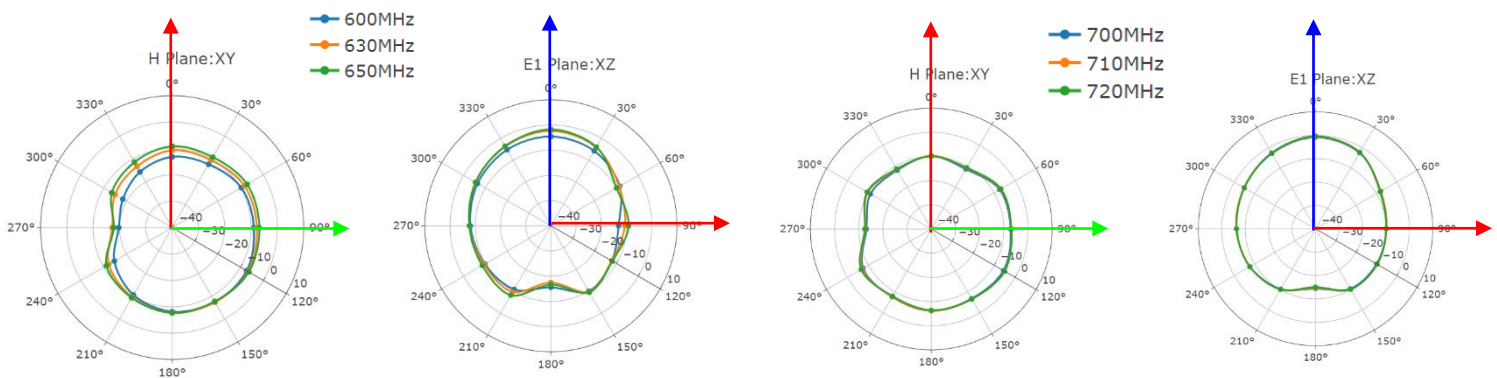
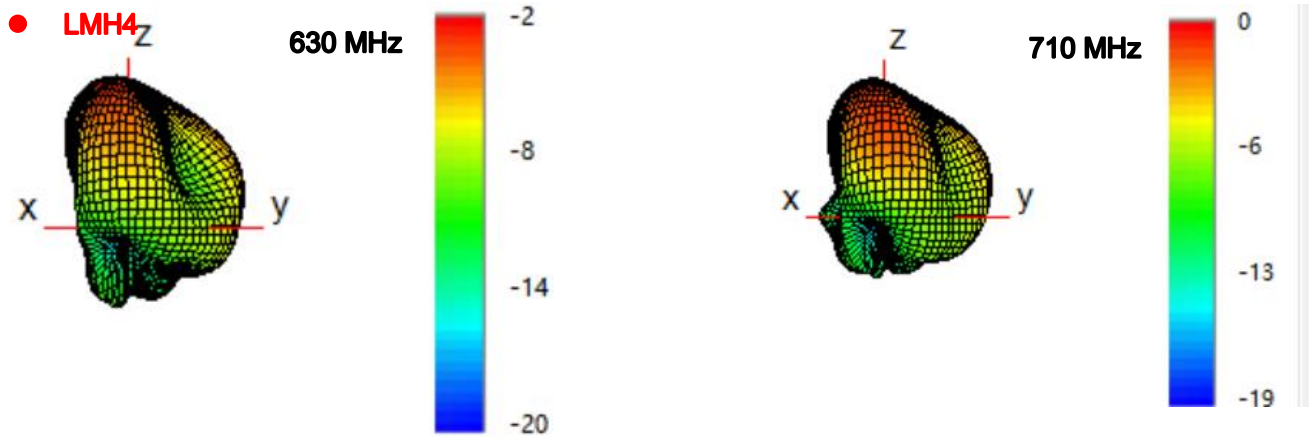


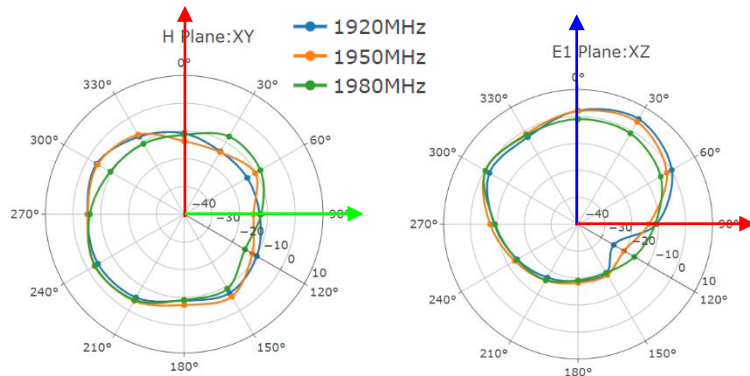
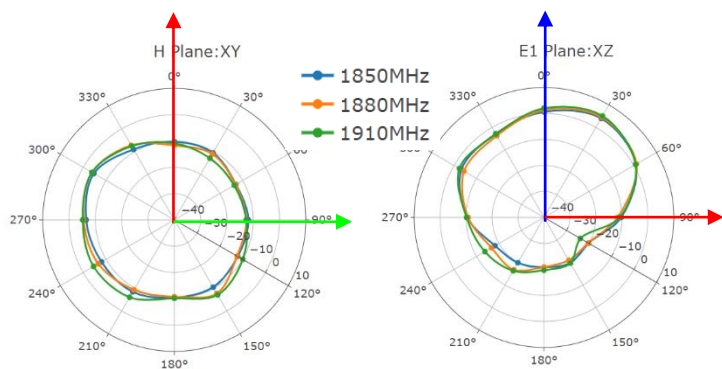
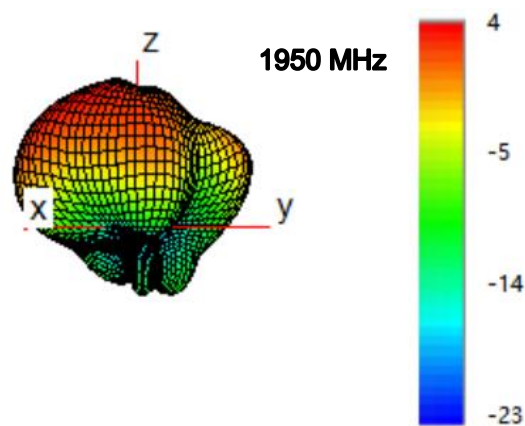
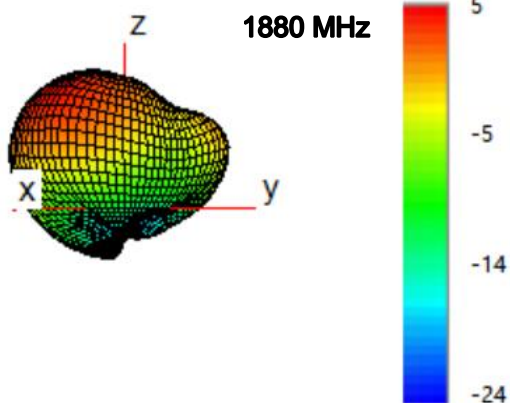
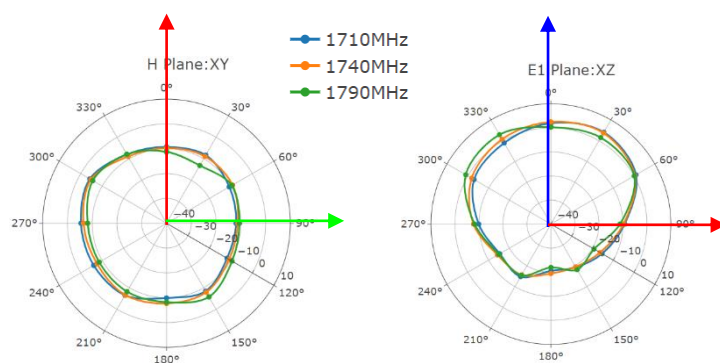
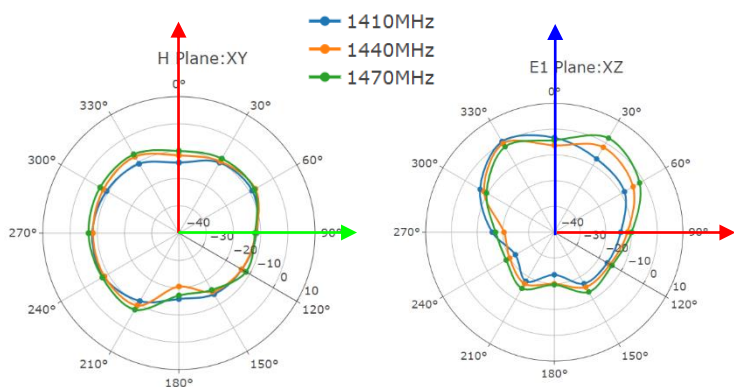
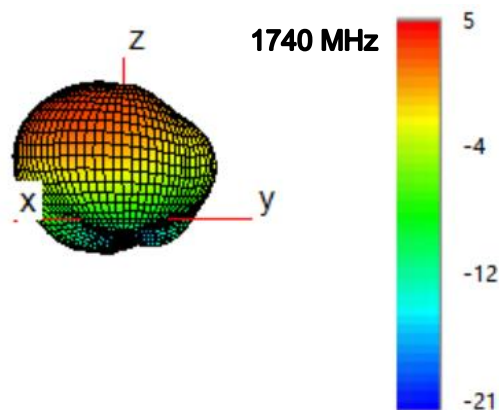
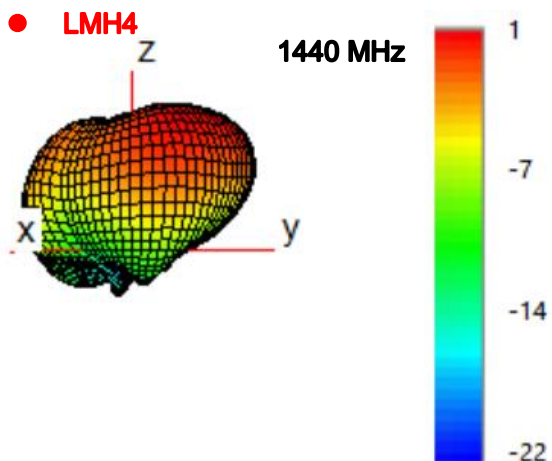
4700 MHz



5500 MHz

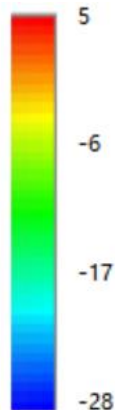




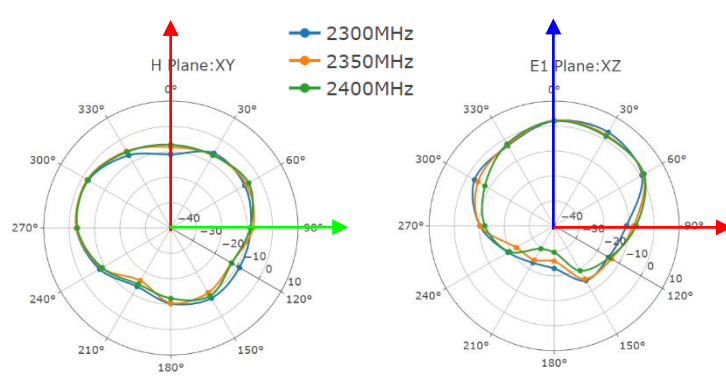
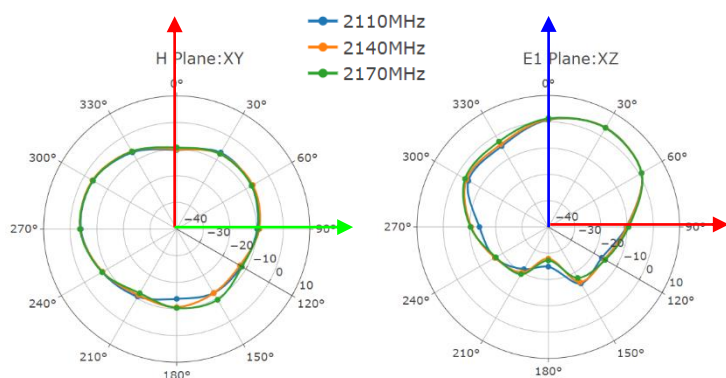
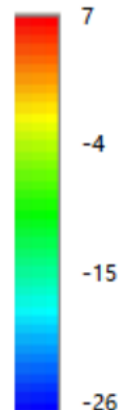


● **LMH4**

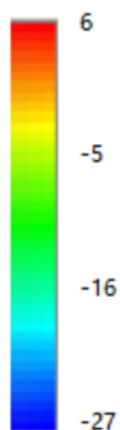
2140 MHz



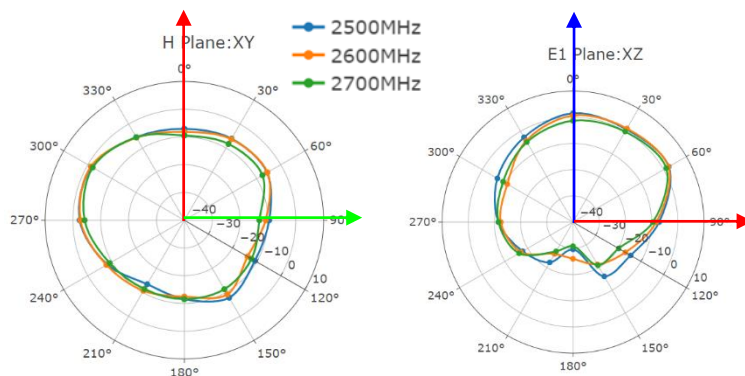
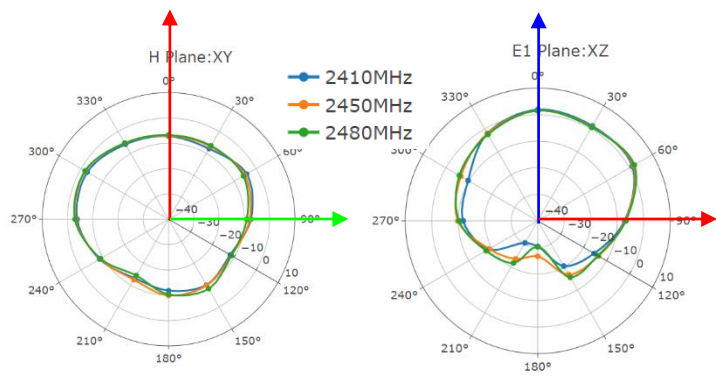
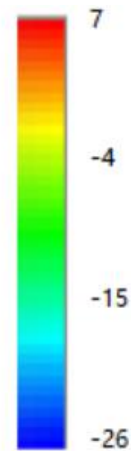
2350 MHz



2450 MHz

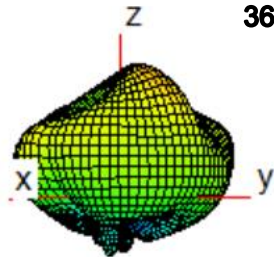


2600 MHz

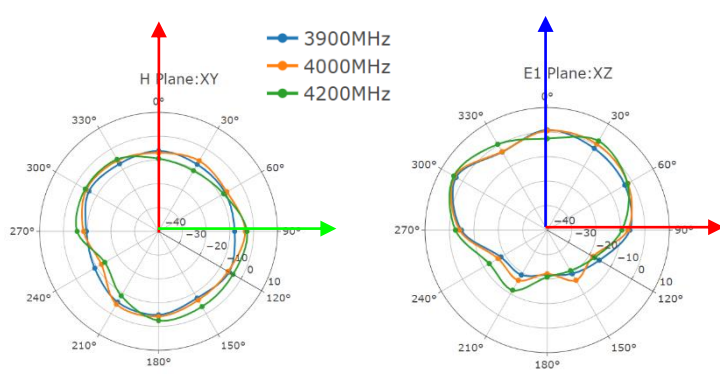
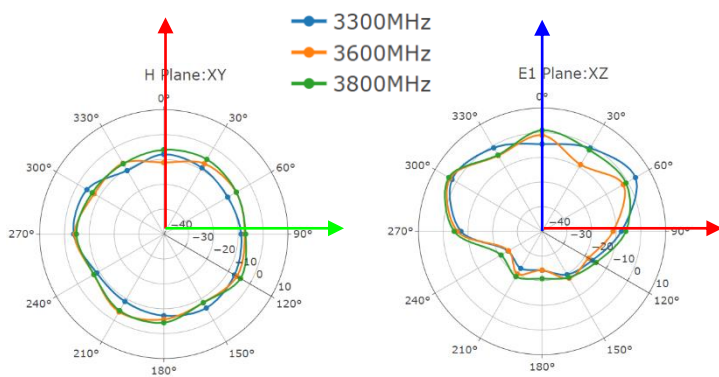
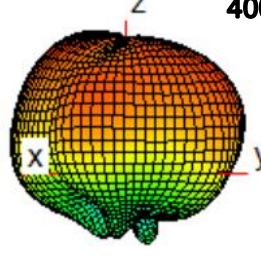


● **LMH4**

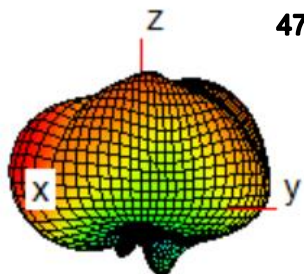
3600 MHz



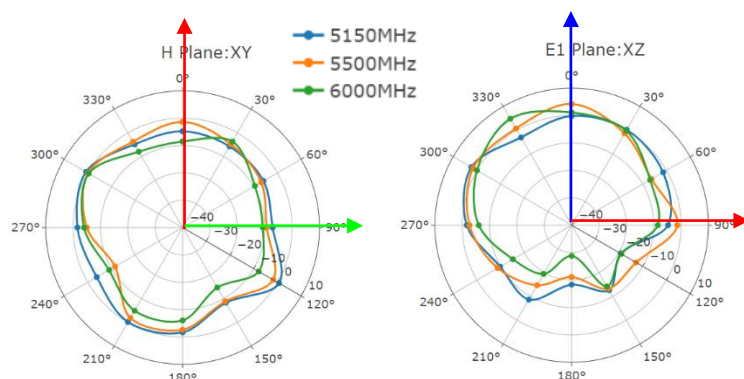
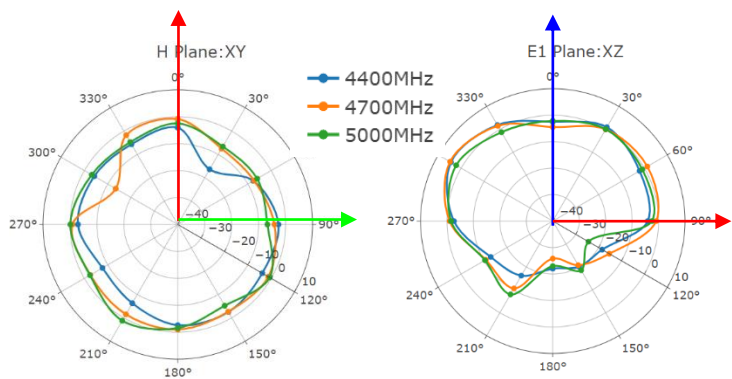
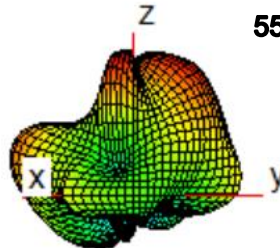
4000 MHz

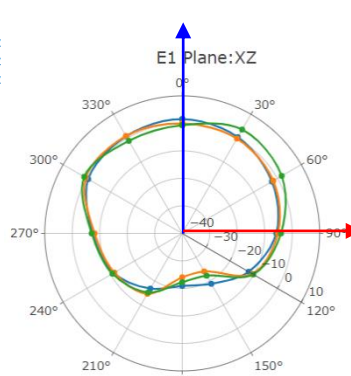
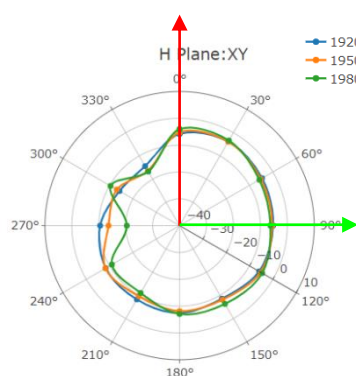
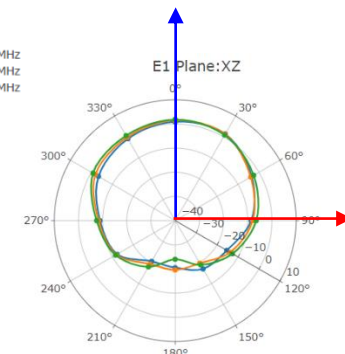
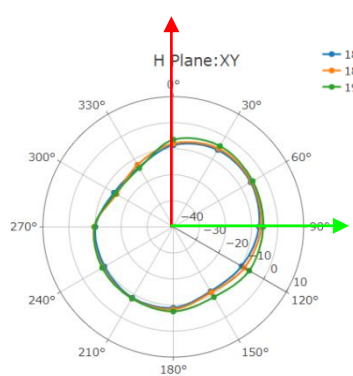
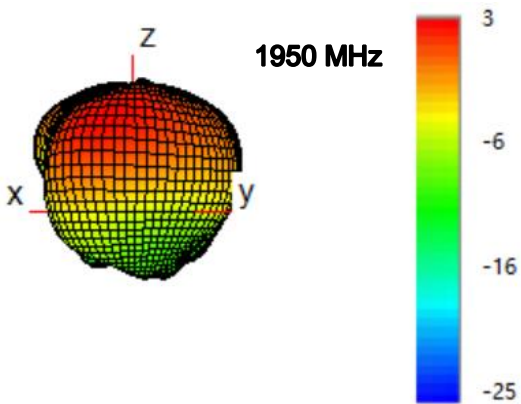
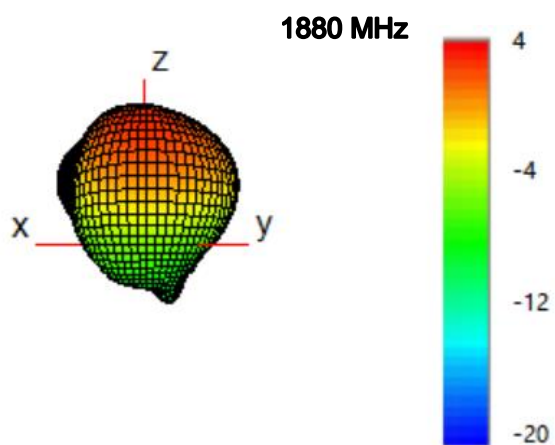
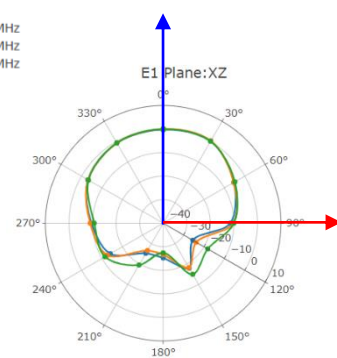
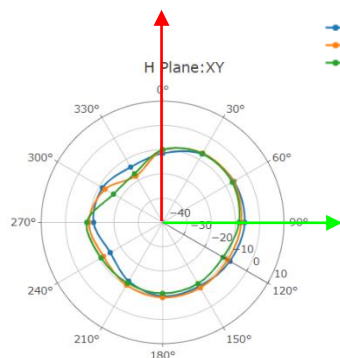
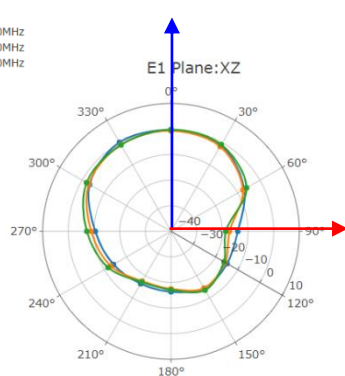
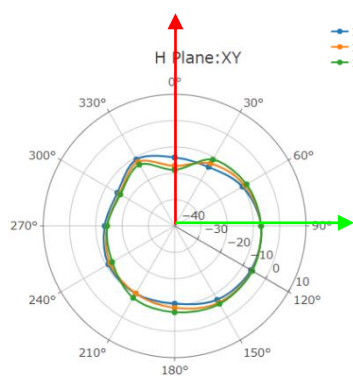
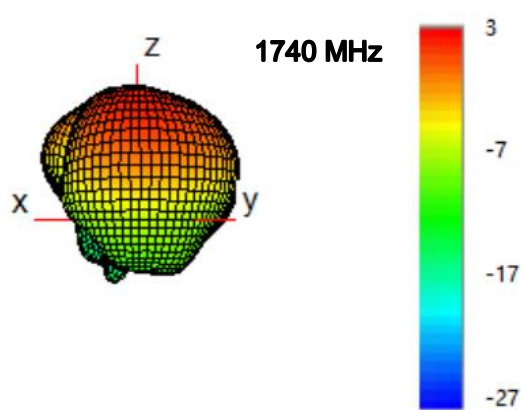
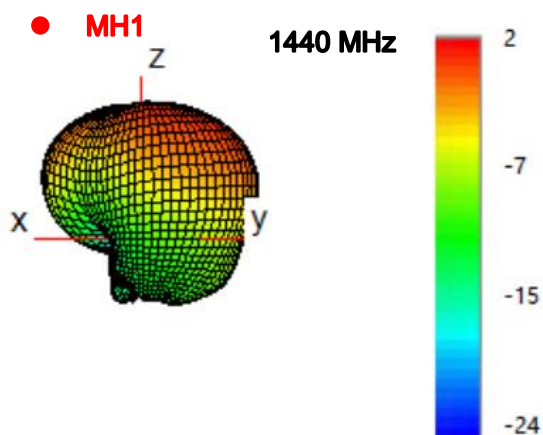


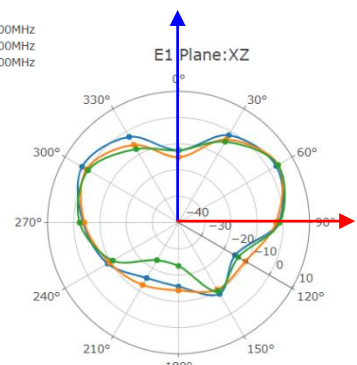
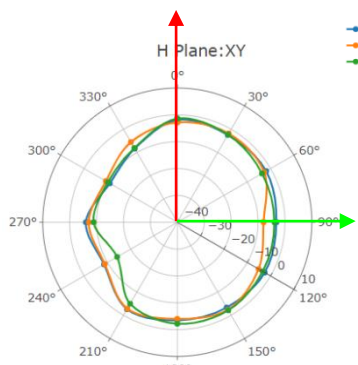
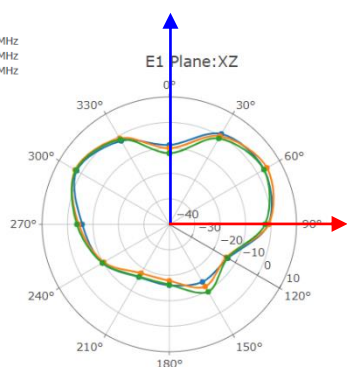
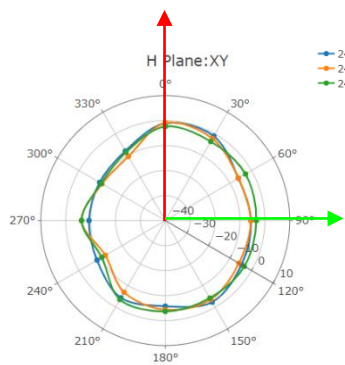
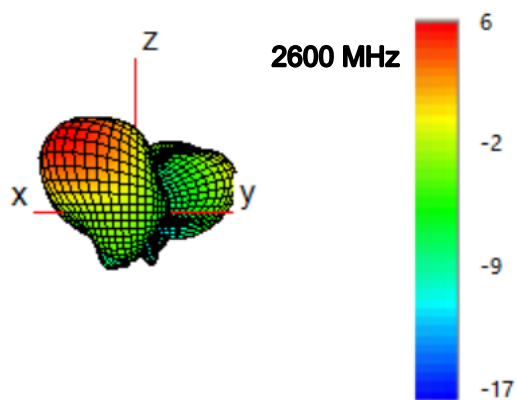
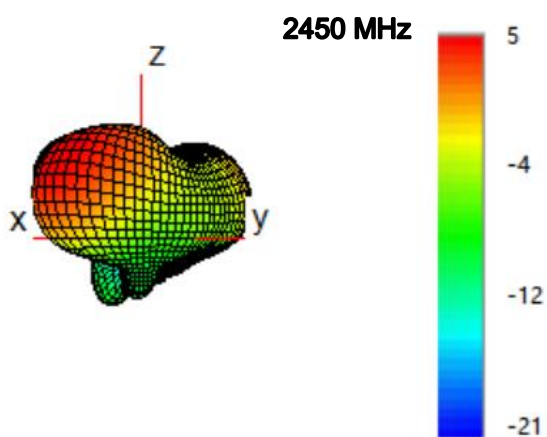
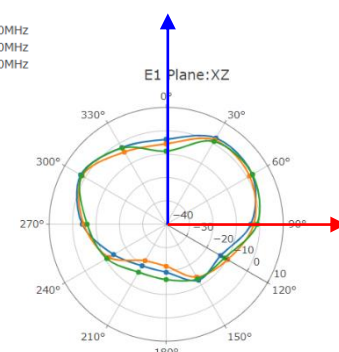
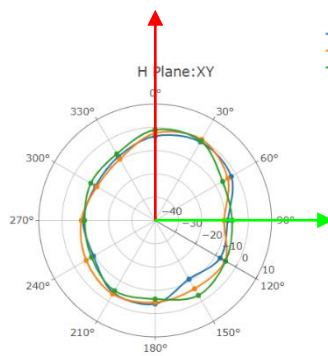
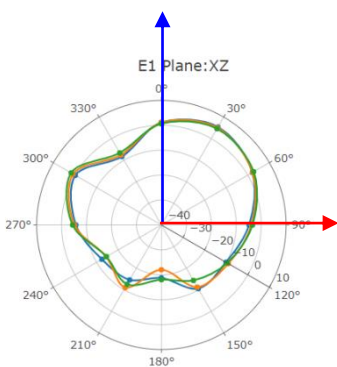
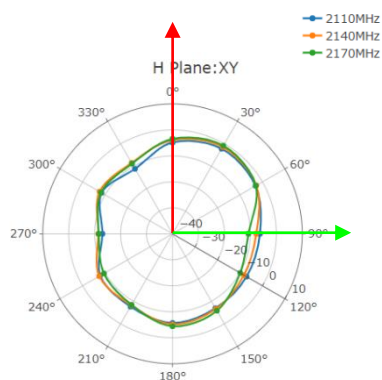
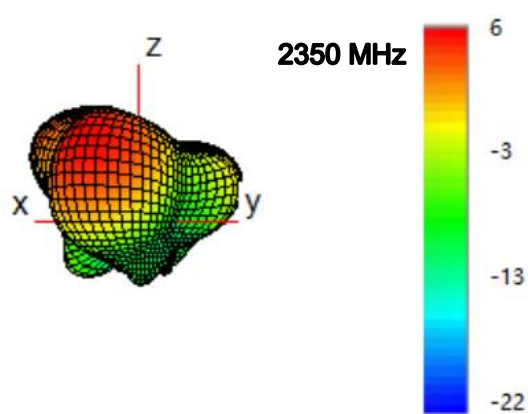
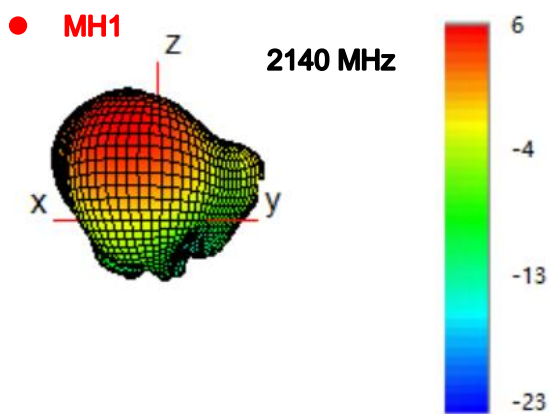
4700 MHz



5500 MHz

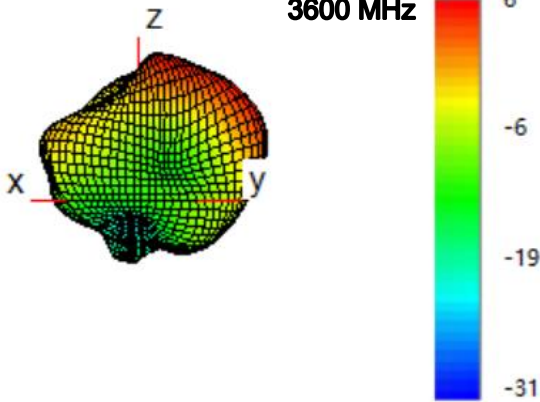




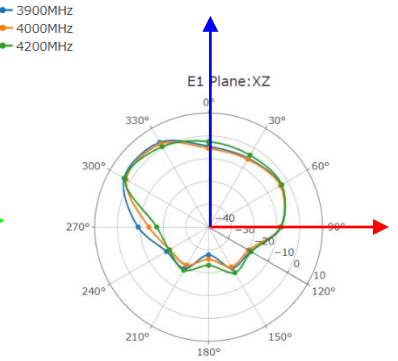
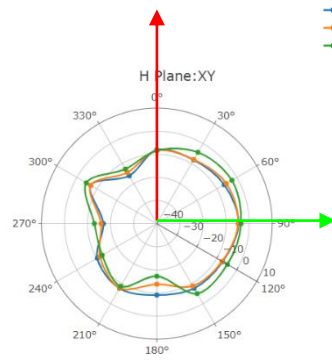
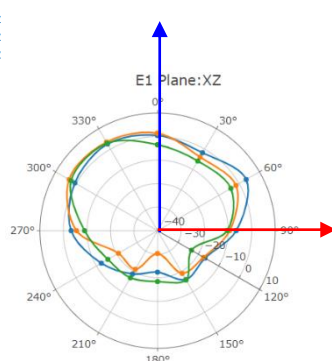
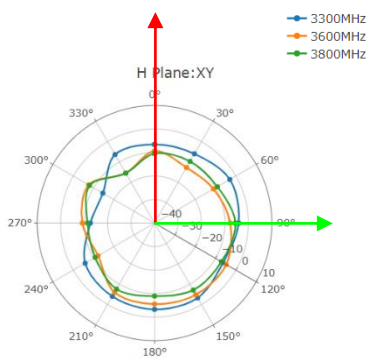
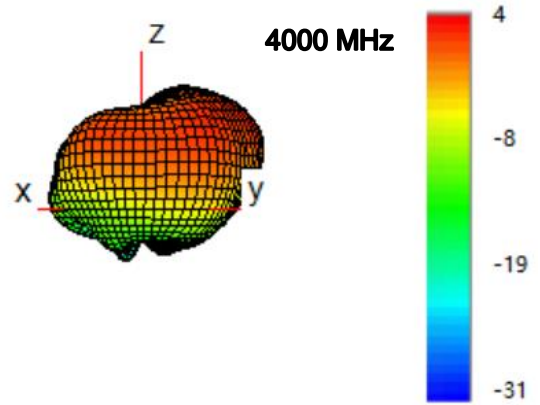


● **MH1**

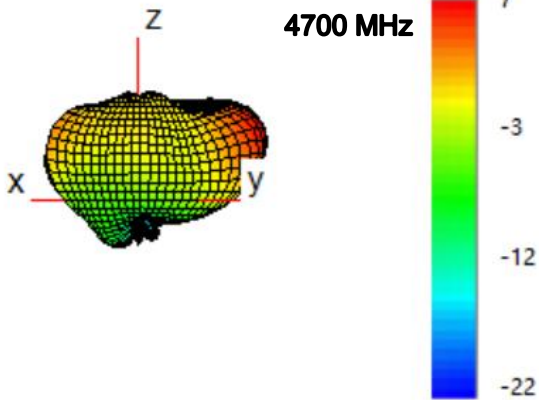
3600 MHz



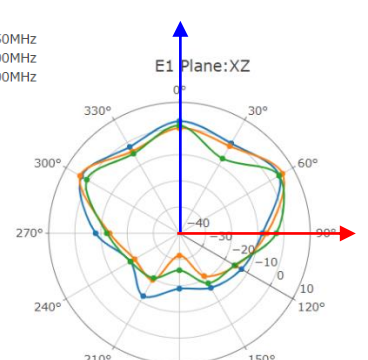
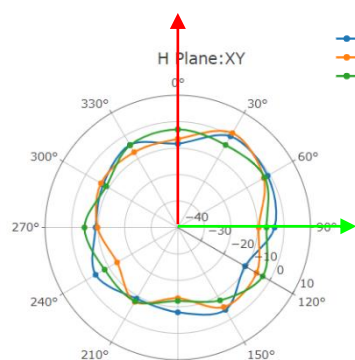
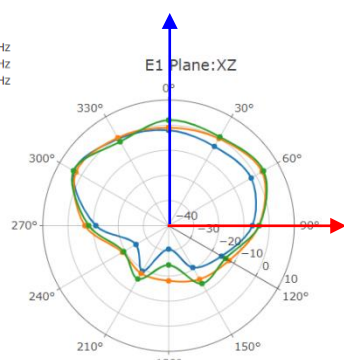
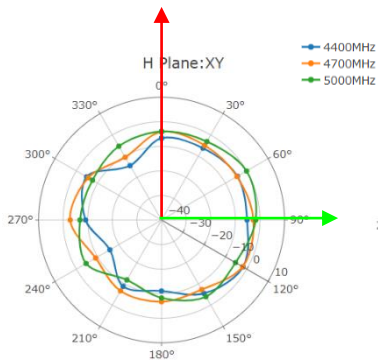
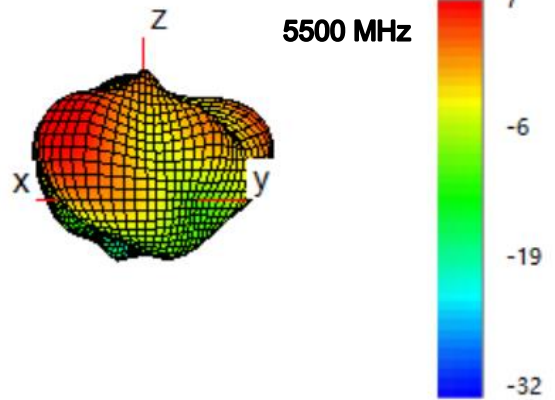
4000 MHz

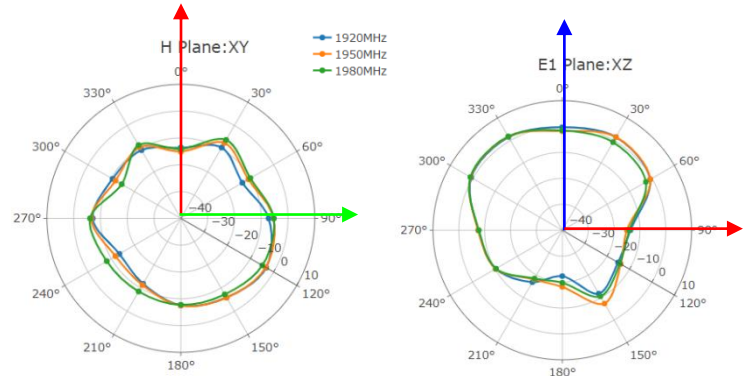
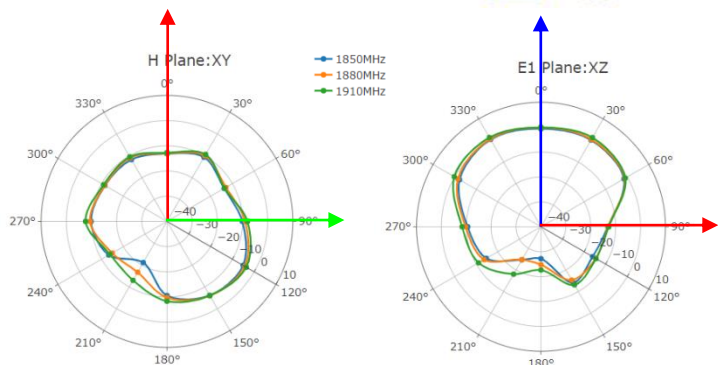
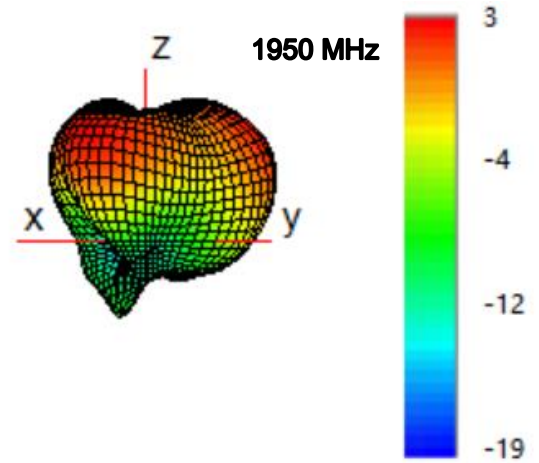
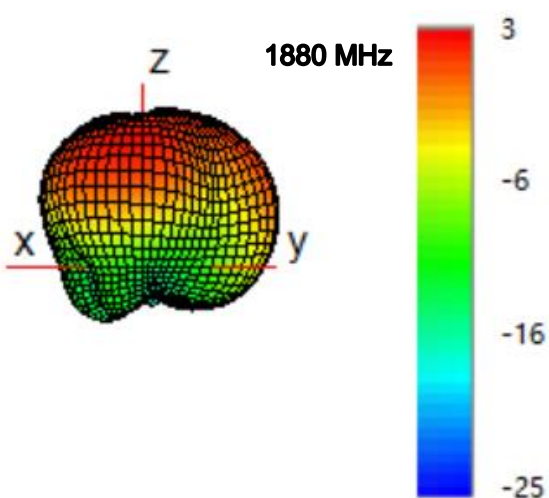
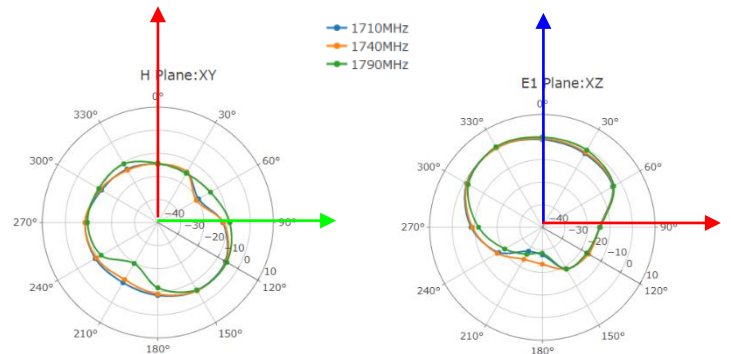
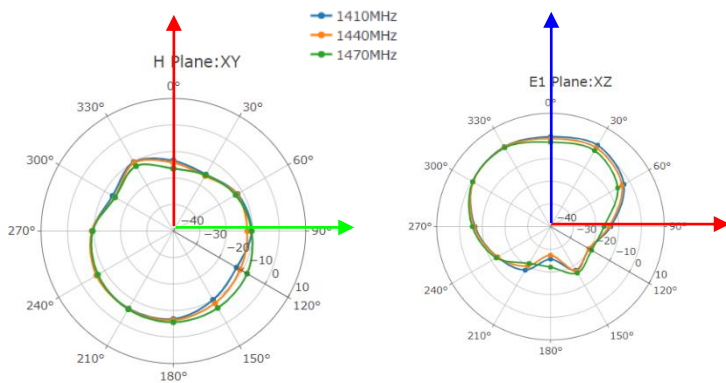
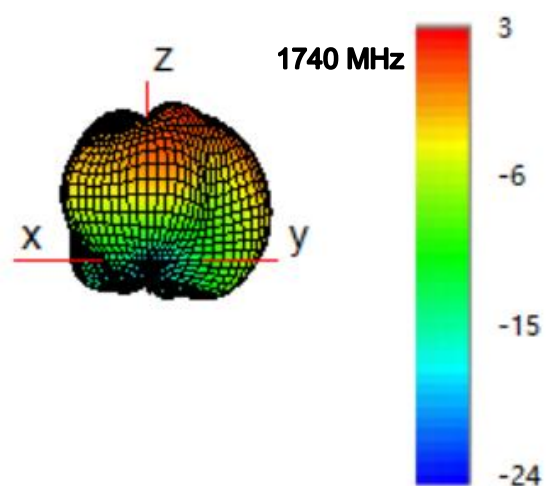
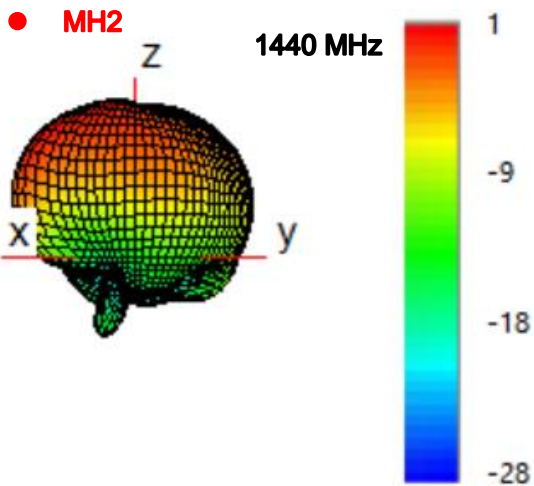


4700 MHz



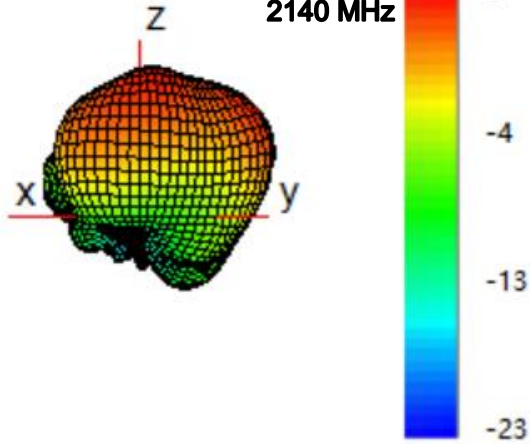
5500 MHz



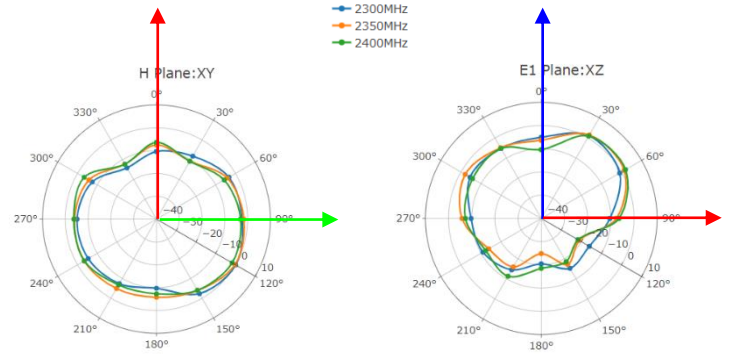
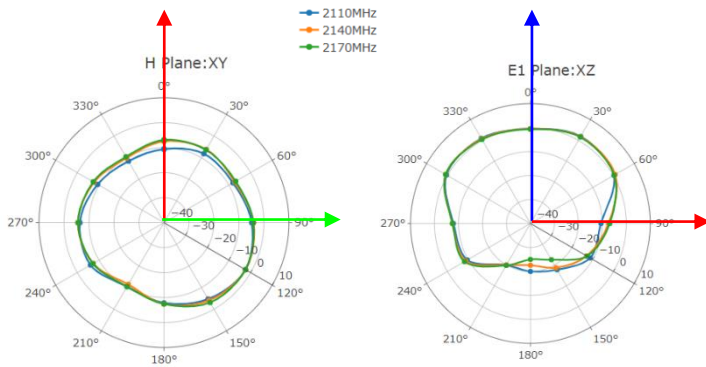
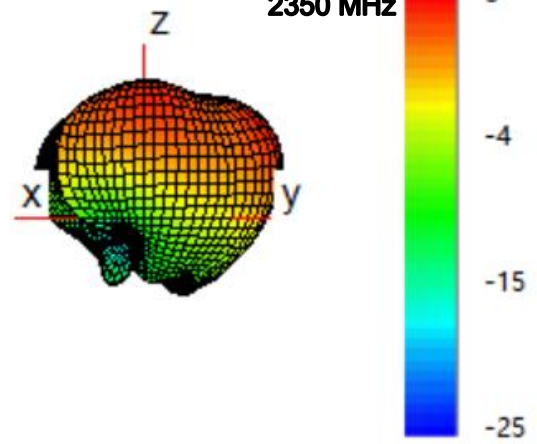


● **MH2**

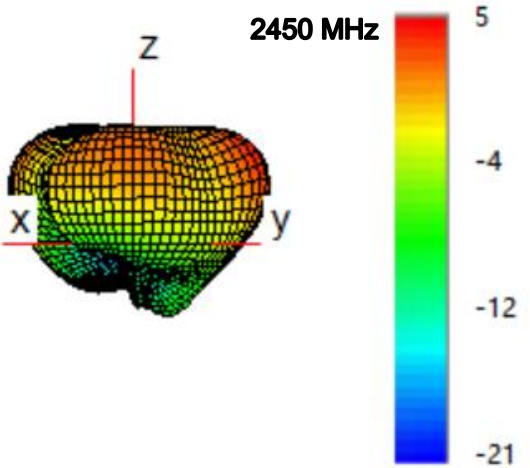
2140 MHz



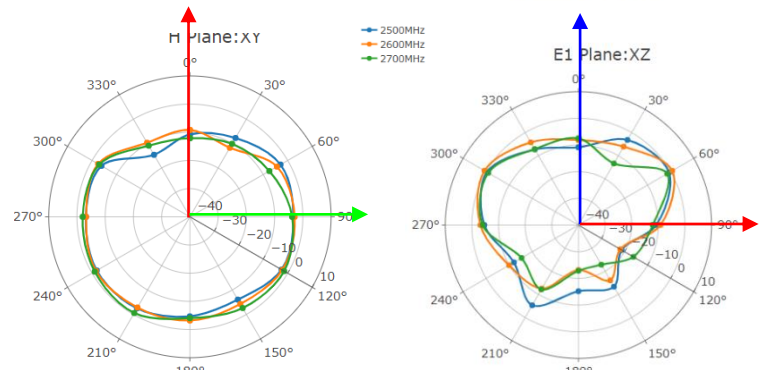
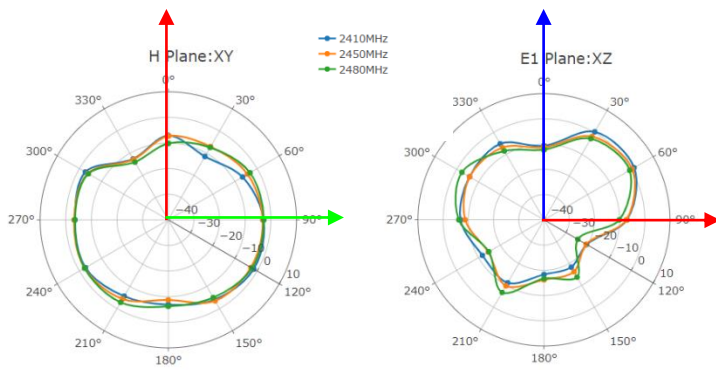
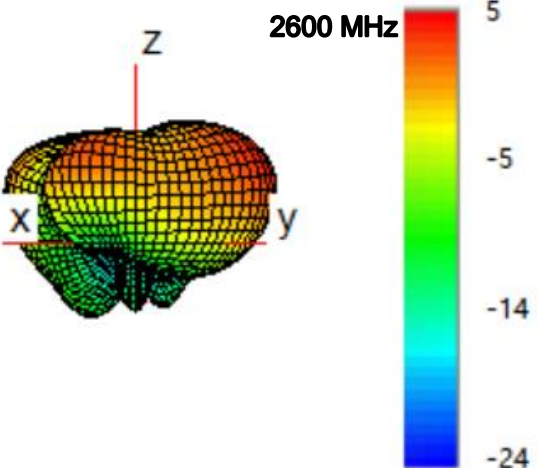
2350 MHz



2450 MHz

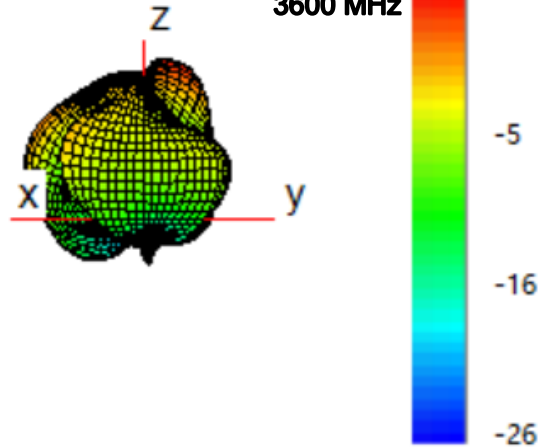


2600 MHz

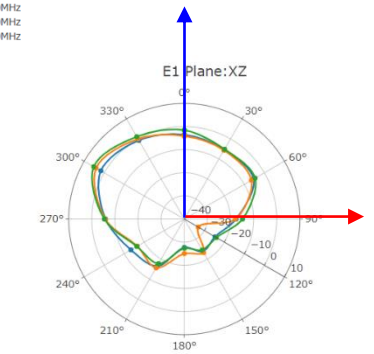
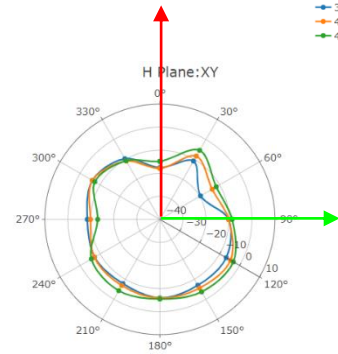
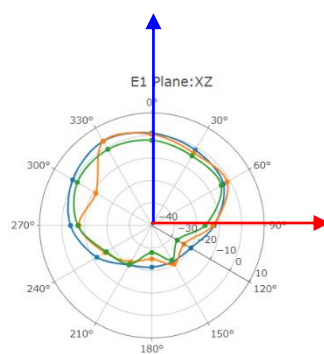
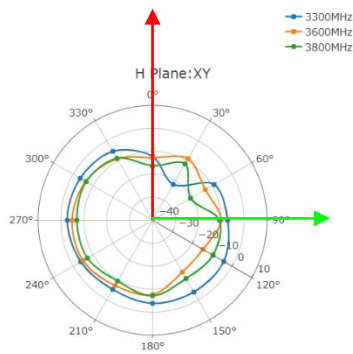
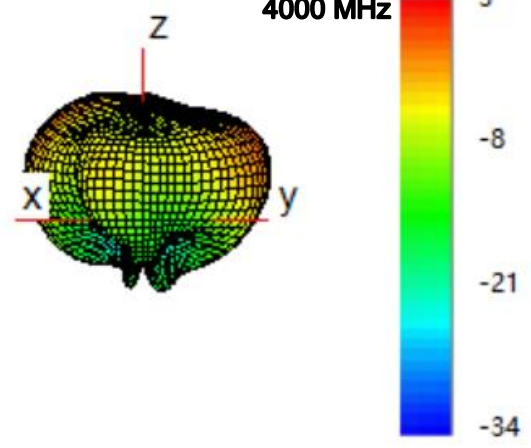


● **MH2**

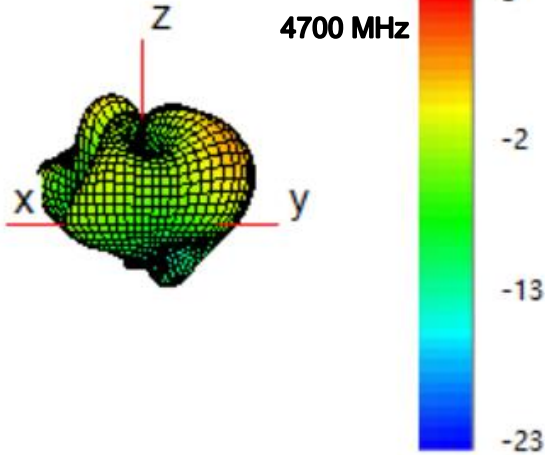
3600 MHz



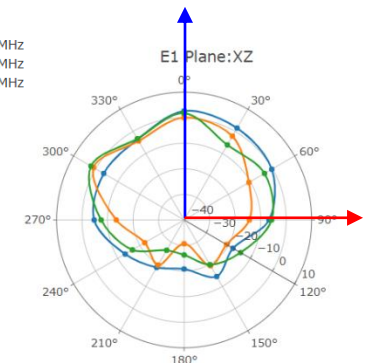
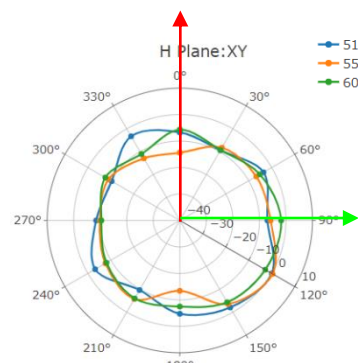
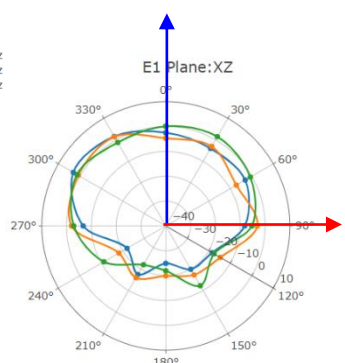
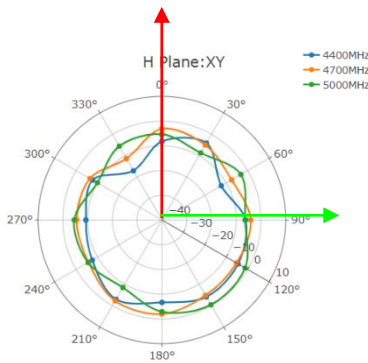
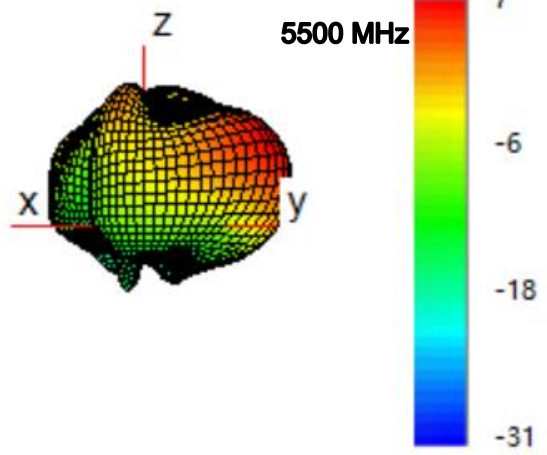
4000 MHz



4700 MHz



5500 MHz



3.3. Active OTA Test

- Based on Module: RG502Q-EA & RG500L-NA
- Test Status: In Free Space.

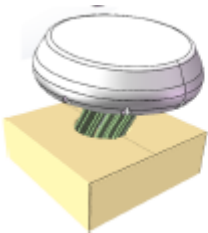
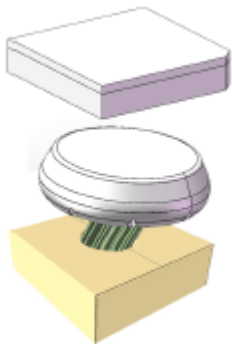
Band		Channel	TRP (dBm)	Channel	TIS (dBm)
LTE	B1 (10M)	18050	20.2	50	-102.7
		18350	19.9	350	-101.7
		18550	19.6	550	-102.1
	B2 (10M)	18650	19.0	650	-101.4
		18900	19.6	900	-101.8
		19150	19.8	1150	-101.4
	B3 (10M)	19250	21.1	1250	-100.4
		19575	20.1	1575	-100.9
		19900	20.7	1900	-100.1
	B4 (10M)	20000	20.5	2000	-102.7
		20175	20.6	2175	-102.6
		20350	20.9	2350	-102.0
	B5 (10M)	20450	19.3	2450	-96.8
		20525	19.4	2525	-96.6
		20600	19.2	2600	-96.9
	B7 (10M)	20800	19.1	2800	-98.3
		21100	20.0	3100	-99.8
		21400	20.7	3400	-100.8
	B8 (10M)	21500	20.0	3500	-97.4
		21625	20.3	3625	-97.7
		21750	20.2	3750	-98.2

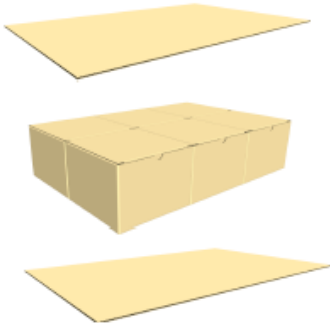
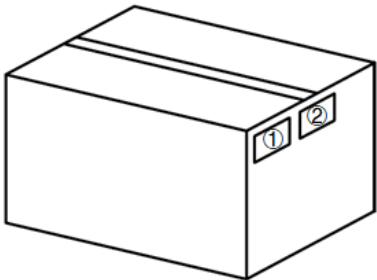
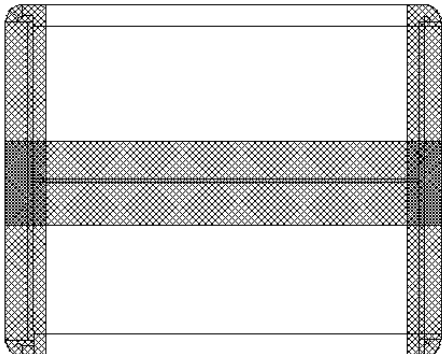
Band		Channel	TRP (dBm)	Channel	TIS (dBm)
	B12 (5M)	23035	19.0	5035	-98.5
		23095	19.2	5095	-97.3
		23155	19.9	5155	-96.1
	B13 (10M)	-	-	-	-
		23230	19.3	5230	-96.2
		-	-	-	-
	B14 (10M)	-	-	-	-
		23330	19.0	5330	-95.0
		-	-	-	-
	B17 (10M)	23780	18.4	5780	-95.9
		23790	18.6	5790	-95.7
		23800	18.6	5800	-95.3
	B18 (10M)	23900	20.4	5900	-97.9
		23925	19.7	5925	-97.8
		23950	19.1	5950	-97.7
	B19 (10M)	24050	19.7	6050	-97.0
		24075	20.4	6075	-97.3
		24100	20.2	6100	-97.3
	B20 (10M)	24200	20.0	6200	-96.9
		24300	19.6	6300	-97.2
		24400	19.7	6400	-97.3
	B25 (10M)	26090	19.4	8090	-100.2
		26365	19.7	8365	-99.8
		26640	19.0	8640	-99.4
	B26 (10M)	26740	18.9	8740	-99.1

Band		Channel	TRP (dBm)	Channel	TIS (dBm)
		26865	19.3	8865	-97.6
		26990	20.6	8990	-98.9
	B28 (10M)	27260	19.2	9260	-96.1
		27335	19.6	9335	-96.6
		27410	18.8	9410	-97.1
	B38 (20M)	37850	20.1	37850	-97.6
		38000	21.7	38000	-97.5
		38150	22.3	38150	-97.6
	B39 (20M)	38350	20.1	38350	-98.3
		38450	20.2	38450	-98.3
		38550	20.2	38550	-98.6
	B40 (20M)	38750	21.4	38750	-97.9
		39150	21.0	39150	-98.4
		39550	20.3	39550	-98.2
	B41 (20M)	40340	20.5	40340	-97.3
		40620	20.9	40620	-97.4
		41140	20.1	41140	-97.2
	B66 (10M)	132022	20.4	66486	-101.8
		132322	20.1	66886	-102.1
		132622	19.5	67086	-101.7
	B71 (10M)	133172	19.9	68636	-96.0
		133297	19.5	68761	-95.1
		133422	19.3	68886	-95.5
5G	N41 (100M)	509202	21.77	509202	-90.18
		518598	21.46	518598	-89.72

Band		Channel	TRP (dBm)	Channel	TIS (dBm)
	N77 (100M)	528000	22.00	528000	-90.44
		623334	22.03	623334	-89.77
		650000	22.60	650000	-90.89
		676666	22.48	676666	-90.11
	N78 (100M)	623334	22.20	623334	-90.01
		636666	22.41	636666	-90.59
		650000	22.58	650000	-91.25
	N79 (100M)	697094	20.67	697094	-89.76
		713990	20.23	713990	-89.48
		729468	19.78	729468	-89.10

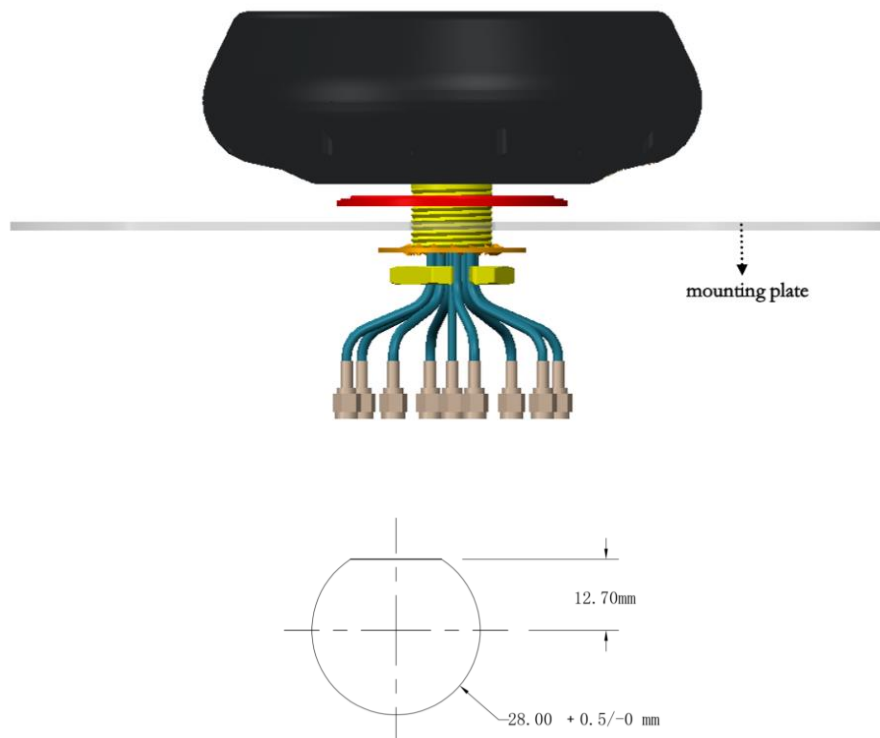
4 Packaging

Step	Packaging Picture - 2D Picture	Description
1	 Lined with cardboard	1 PC: Antenna 1 PC: Lined with Cardboard Size: 185 × 185 × 60 mm Arrange the antenna and put it in the lined cardboard.
2	 EPE Pearl Foam Lined with cardboard	1 PC: EPE Pearl Foam Size: 186 × 186 × 40 mm After placing the product, use EPE Pearl Foam on the upper layer.
3	 Inner Box	1 PC: Inner Box Size: 191 × 191 × 135 mm Place the antenna and lining cardboard in the inner box.

4	 Clapboard Inner Box Clapboard	1 PC: Carton Size: 600 × 404 × 164 mm Antenna: 6 PCS / Carton 2 PCS: Clapboard Size: 588 × 392 mm Place 1 clapboard on the bottom, 6 pcs antennas in the middle and 1 pc clapboard on the top.
5		Labeling ① Carton label ② Quality label
6		Sealing Cartons H-shaped sealing cartons

5 Installation

- Recommended hole dimensions as below.
- Recommended mounting plate thickness: ≤ 3 mm.
- Reference torque: 10-12N. M.



Hole for housing or mounting plane

Installation Instructions					
Tube Mark	Tube Color	Cable	Connector	Frequency (MHz)	Technology
LMH	Red	ALS302	SMA Male	600–960 MHz, 1400–6000 MHz	5G/4G/3G/2G
MH	Black	ALS302	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

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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NOTE



This product must not be disposed of as normal household waste, in accordance with EU directive for waste electrical and electronic equipment (WEEE- 2012/19/EU). Instead, it should be disposed of by returning it to the point of sale, or to a municipal recycling collection point.

Revision History

Version	Date	Author	Note
-	2025-02-11	Mordecai LIU/ Mike GUO/ Riva REN/ Rainey LIAO	Creation of the document
1.0	2025-02-11	Mordecai LIU/ Mike GUO/ Riva REN/ Rainey LIAO	First official release



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