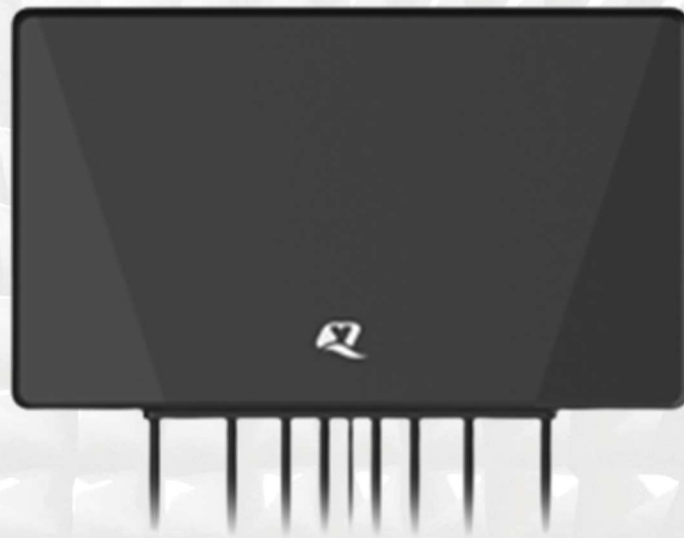




Antenna Datasheet

Product OC: YEMA013AA

Version: 2.0

Date: 2023-08-04

Status: Released

Product Name: 5G & GNSS 9IN1 Combo Antenna

Key Features:

4 × 5G/4G LMH 600–6000 MHz

4 × 5G/4G MH 1400–6000 MHz

1 × Active GNSS

Dimensions: 264.6 × 157.6 × 30.5 mm

Mount: Adhesive/Wall/Suction

Connectors: SMA Male

IP Rating: IP67 & IP69K

Compatible with ECE-R118 cables under demand

Overview

The Quectel YEMA013AA is a combo antenna, which is a low-profile 9in1 adhesive omni-directional antenna with IP69 waterproof rating. The YEMA013AA series can also support wall/suction cup mounting types. It comes with 4 × 5G/4G LMH 600–6000 MHz, 4 × 5G/4G MH 1400–6000 MHz and 1 × Active GNSS as standard.

The YEMA013AA series covers fallback to 3G/2G bands where 5G/4G coverage is not available and can also be used to cover LPWA, Cat-M, NB-IoT, ZigBee, ISM. The 5G/4G MH antennas can support Wi-Fi/BT applications. The GNSS antenna supports GPS/ GLONASS/ GALILEO/ BEIDOU/ QZSS/ IRNSS for positioning.

The antenna can be used with various GND planar sizes or free space for easy integration, and can be connected via 9 cables with different cable lengths (300–5000 mm) terminated with SMA connectors. It is compatible with Quectel's RM520x series of modules. Quectel offers comprehensive antenna design support such as simulation, testing, and fabrication of custom antenna solutions to meet your specific application requirements.

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1 Specification

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		≤ -7.0 dB
Axial Ratio (GNSS)		< 3 dB

1.1.1. LMHs

SPEC	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		3.3	3.1	5.0	3.5	3.4	3.0	2.8	4.2	2.9	2.4	2.1
	MP		3.5	4.2	6.7	3.8	4.0	3.3	3.7	4.5	2.9	2.8	2.2
Max Return Loss (dB)	FS		-5.4	-5.8	-3.5	-5.1	-5.3	-6.0	-6.4	-4.2	-6.2	-7.7	-8.8
	MP		-5.1	-4.2	-2.6	-4.6	-4.5	-5.5	-4.8	-4.0	-6.4	-6.5	-8.5
AVG Eff. (%)	FS		39.7	46.3	37.9	55.4	56.9	59.5	63.1	58.3	62.7	55.3	54.8
	MP		36.7	33.9	31.4	54.5	59.8	61.3	56.5	54.0	56.6	48.6	41.0

AVG AVG Gain (dB)	FS	-4.0	-3.4	-4.2	-2.6	-2.5	-2.3	-2.0	-2.4	-2.1	-2.6	-2.6
	MP	-4.5	-4.8	-5.1	-2.7	-2.3	-2.2	-2.6	-2.7	-2.5	-3.2	-3.9
Max Peak Gain (dBi)	FS	1.6	1.6	3.0	4.1	5.6	4.3	4.4	5.0	4.8	4.2	4.7
	MP	1.6	2.0	2.4	7.4	7.2	7.7	6.0	4.4	6.4	5.6	5.7
VSWR	FS	≤ 5.0										
	MP	≤ 6.7										
Return Loss	FS	≤ -3.5 dB										
	MP	≤ -2.6 dB										
Peak Gain	FS	≤ 5.6 dBi										
	MP	≤ 7.7 dBi										

- LMHs: LMH1, LMH2, LMH3, LMH4 Antennas
- MHs: MH1, MH2, MH3, MH4 Antennas
- FS: In Free Space
- MP: On 500 × 500 mm Metal Plane

1.1.2. MHs

SPEC	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	-	-	-	3.8	2.7	2.3	3.4	3.7	2.3	2.1	2.5	
	MP	-	-	-	4.1	2.8	2.3	3.3	3.5	2.2	2.0	2.7	
Max Return Loss (dB)	FS	-	-	-	-4.6	-6.7	-8.3	-5.2	-4.8	-7.9	-9.2	-7.3	
	MP	-	-	-	-4.4	-6.5	-8.0	-5.4	-5.0	-8.6	-9.5	-6.9	
AVG Eff. (%)	FS	-	-	-	45.3	51.9	57.0	52.5	52.9	63.8	62.1	59.1	
	MP	-	-	-	43.6	54.0	52.3	52.5	53.1	57.0	56.2	50.4	
AVG AVG Gain (dB)	FS	-	-	-	-3.5	-2.9	-2.5	-2.8	-2.8	-2.0	-2.1	-2.3	
	MP	-	-	-	-3.6	-2.7	-2.8	-2.8	-2.8	-2.5	-2.5	-3.0	
Max Peak Gain (dBi)	FS	-	-	-	3.8	4.0	3.1	3.2	3.9	5.8	6.3	6.0	
	MP	-	-	-	5.6	6.2	6.1	6.5	6.2	8.2	7.4	7.4	
VSWR	FS	≤ 3.8											
	MP	≤ 4.1											

Return Loss	FS	≤ -4.6 dB
	MP	≤ -4.4 dB
Peak Gain	FS	≤ 6.3 dBi
	MP	≤ 8.2 dBi

- LMHs: LMH1, LMH2, LMH3, LMH4 Antennas
- MHs: MH1, MH2, MH3, MH4 Antennas
- FS: In Free Space
- MP: On 500 × 500 mm Metal Plane

1.1.3. GNSS

Specification	Band	Band	GNSS L5	GNSS L2	GNSS L1
		Freq. (MHz)	1164 - 1189	1217 - 1238	1559 - 1606
Max VSWR	FS		1.42	-	1.68
	MP		1.54	-	1.45
Max Return Loss (dB)	FS		-15.2	-	-14.3
	MP		-13.3	-	-13.6
AVG Eff. (%)	FS		58.9	-	52.5
	MP		57.7	-	52.1
AVG Gain (dB)	FS		-2.3	-	-2.8
	MP		-2.4	-	-2.8
Max Peak Gain (dBi)	FS		2.8	-	4.5
	MP		4.0	-	6.3
VSWR	FS		≤ 2		
	MP		≤ 2		
Return Loss	FS		≤ -10 dB		
	MP		≤ -10 dB		
Peak Gain	FS		≤ 4.5 dBi		
	MP		≤ 6.3 dBi		

- LMHs: LMH1, LMH2, LMH3, LMH4 Antennas
- MHs: MH1, MH2, MH3, MH4 Antennas
- FS: In Free Space
- MP: On 500 × 500 mm Metal Plane

GNSS LNA Electrical	
LNA Gain	28 ±3 dB
Noise Figure	≤ 3.5 dB
Output VSWR	< 2.0
Input VSWR	< 2.0
Working Voltage	DC 2.8–3.6 V
Working Current	21 ±3 mA (Typ. 3 V)
Impedance	50 Ω

- LMHs: LMH1, LMH2, LMH3, LMH4 Antennas
- MHs: MH1, MH2, MH3, MH4 Antennas
- FS: In Free Space
- MP: On 500 × 500 mm Metal Plane

1.2. Supported Bands

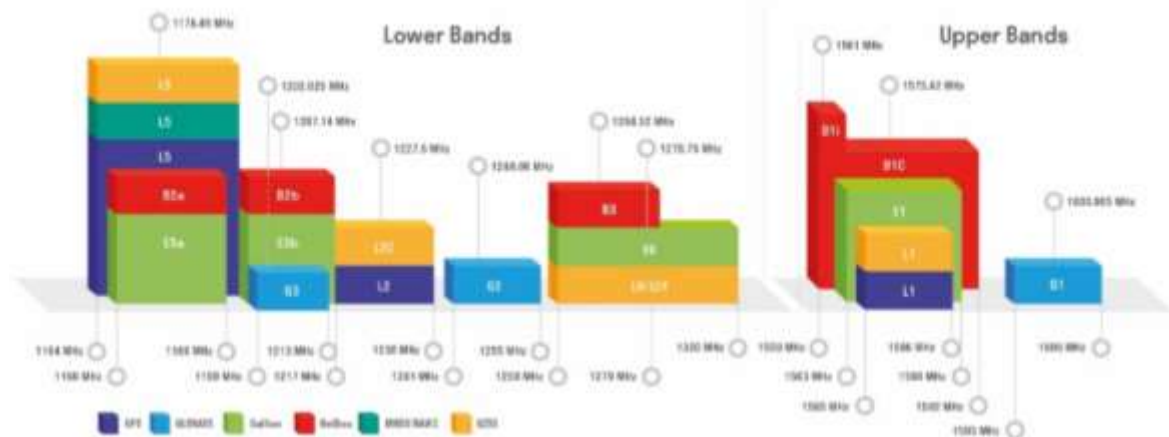
5G NR/ LTE/ LTE-Advanced/ WCDMA/ HSPA/ HSPA+/ GPRS/ GSM/ NB-IoT					
Band	Frequency (MHz)	Uplink (MHz)	Downlink (MHz)	LMHs	MHs
1	2100	1920–1980	2110–2170	√	√
2	1900	1850–1910	1930–1990	√	√
3	1800	1710–1785	1805–1880	√	√
4	1700	1710–1755	2110–2155	√	√
5	850	824–849	869–894	√	-
7	2600	2500–2570	2620–2690	√	√
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	√	-

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

5G NR/ LTE/ LTE-Advanced/ WCDMA/ HSPA/ HSPA+/ GPRS/ GSM/ NB-IoT					
Band	Frequency (MHz)	Uplink (MHz)	Downlink (MHz)	LMHs	MHs
78	3500	3300–3800		√	√
79	4500	4400–5000		√	√
Note: Covered √ means efficiency > 20%					

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



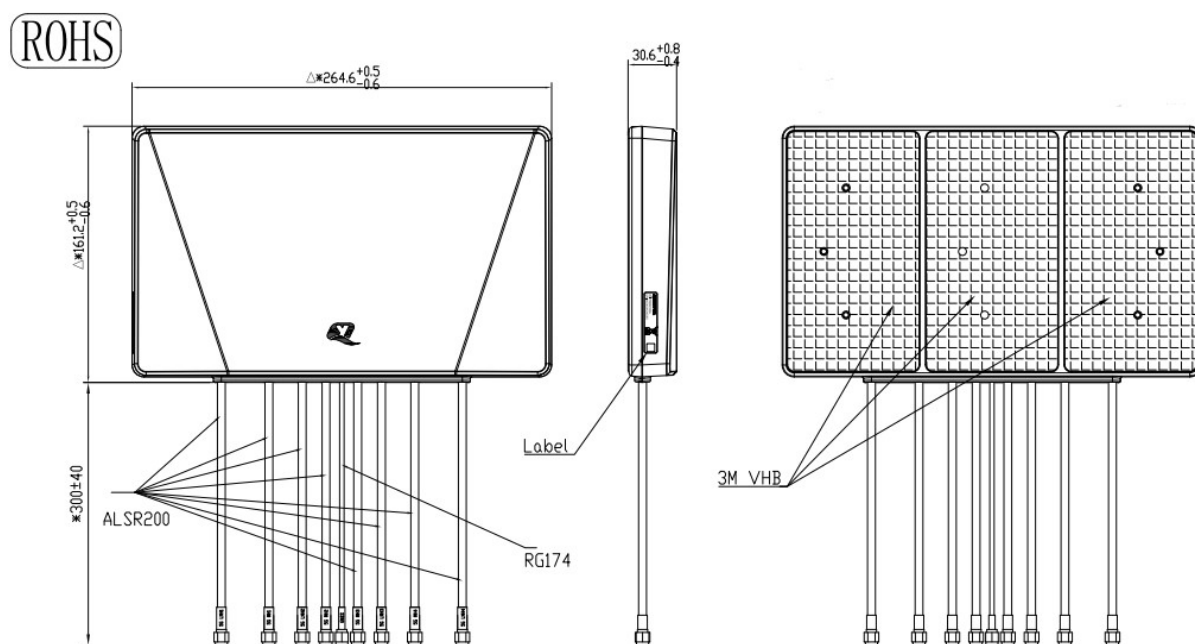
1.3. Mechanical & Environmental

Mechanical		
Antenna Size	YEMA013AA	264.6 × 161.2 × 30.6 mm
	YEMX913J1A	316.4 × 161.2 × 37.8 mm
Casing Material & Color		PC & Black
Cable Type & Length	LMHs & MHs	ALSR200 Black & 300 mm
	GNSS	RG174 Black & 300 mm
Weight	YEMA013AA	837 g
	YEMX913J1A	933.5 g
Connector Type		SMA Male (The current state of the SMA connector is not waterproof. If a waterproof connector is need, it can be customized, such as a waterproof FAKRA connector.)
Mounting Type	YEMA013AA	Adhesive
	YEMX913J1A	Wall Mounting & Suction Cup Mounting (Suction Cup Mounting is only suitable for temporary installation on the indoor glass surface, the installation height is less than 2 meters)
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

- LMHs: LMH1, LMH2, LMH3, LMH4 Antennas
- MHs: MH1, MH2, MH3, MH4 Antennas
- FS: In Free Space
- MP: On 500 × 500 mm Metal Plane

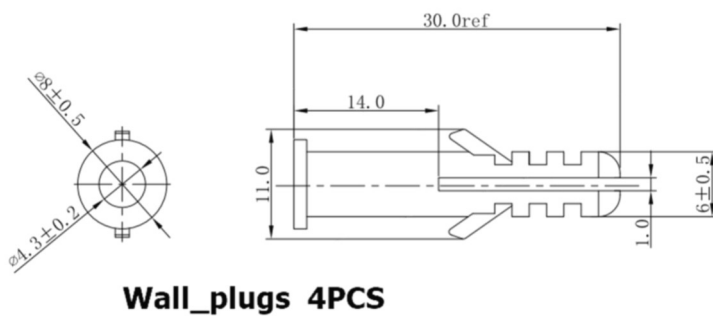
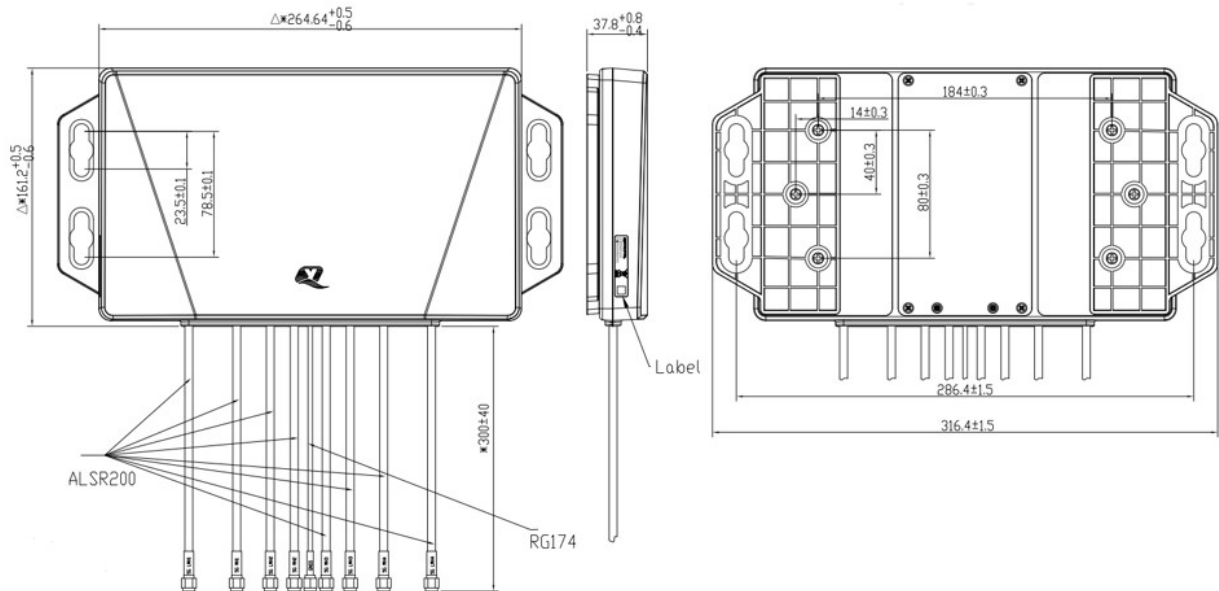
2 Drawing

YEMA013AA

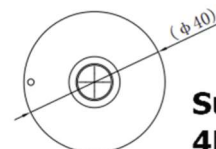
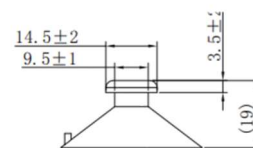


YEMX913J1A

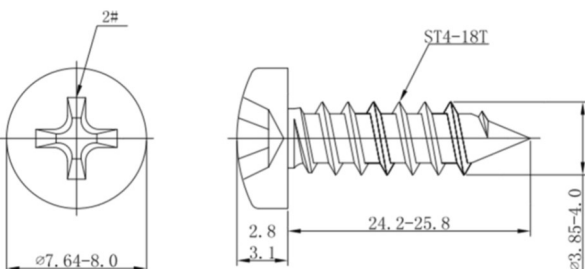
ROHS



Wall_plugs 4PCS



Suction Cup 4PCS



Screw 4PCS

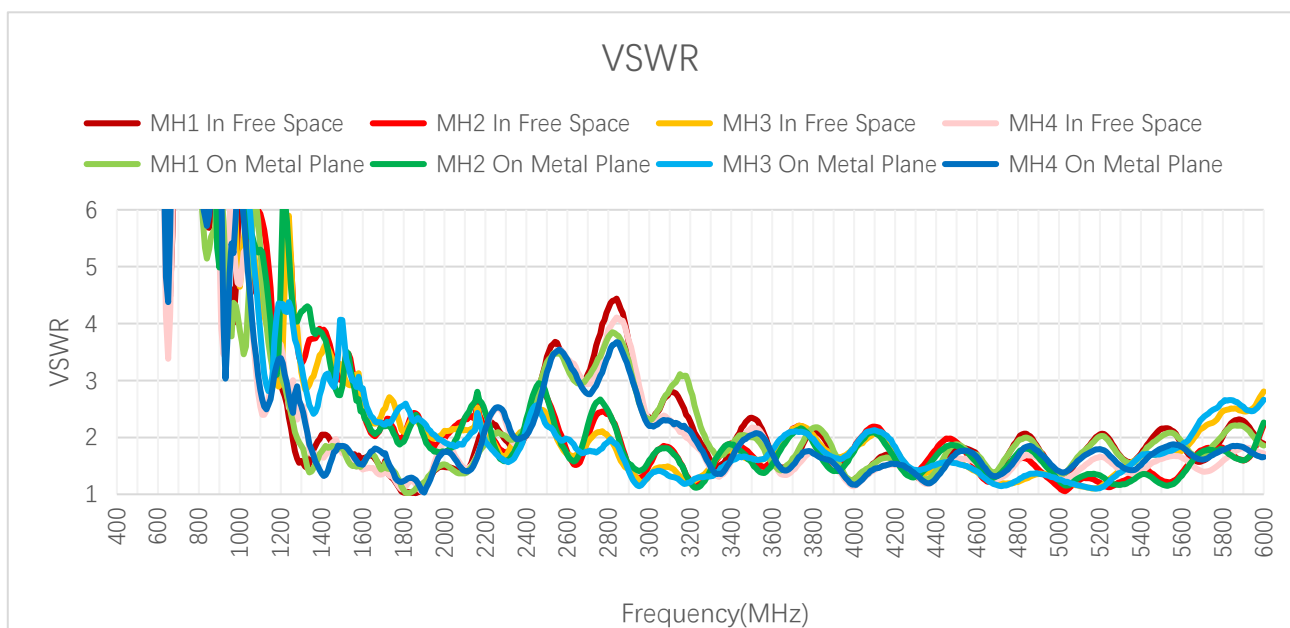
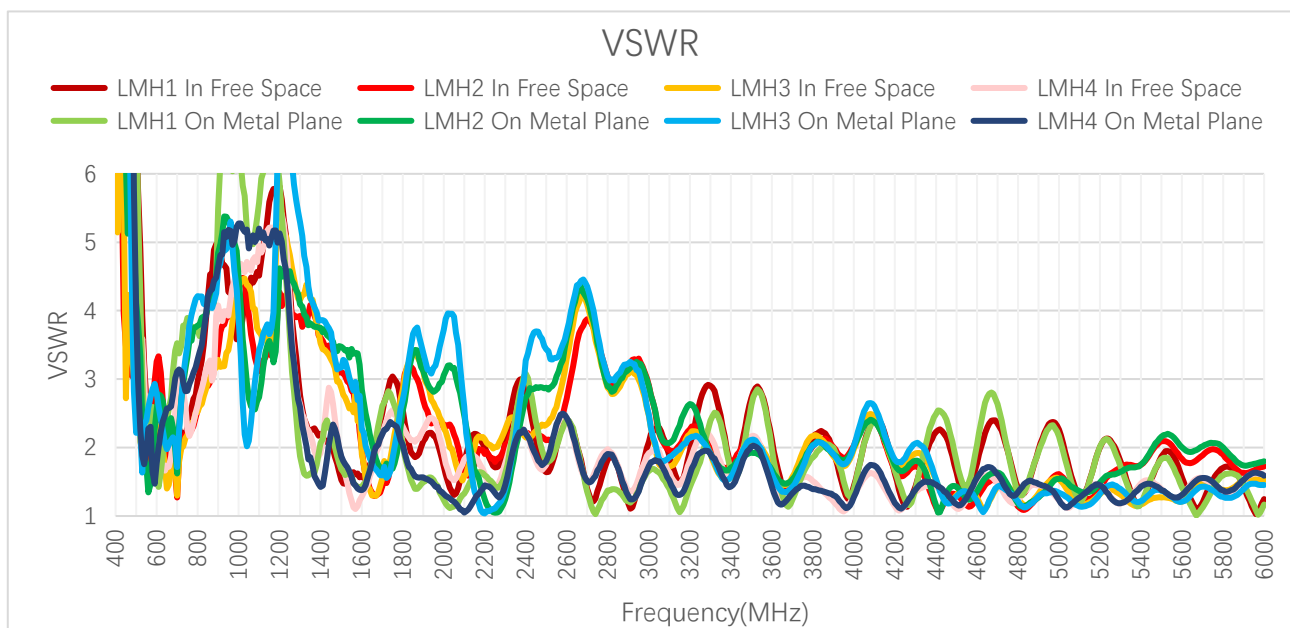


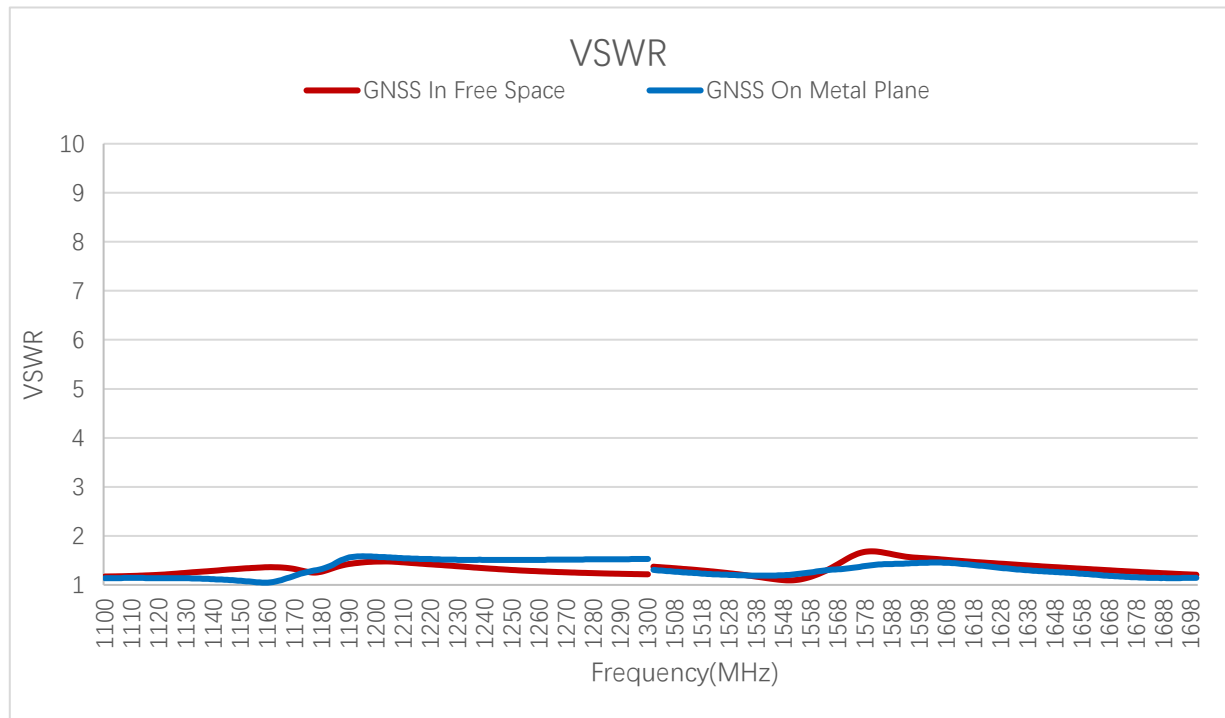
Gasket 4PCS

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	3.0	2.2	2.3	3.5	4.8	4.2	2.1	2.7	3.0	1.9
	MP	1.5	1.9	3.4	3.8	5.5	6.4	2.3	2.7	2.8	1.4
LMH2	FS	3.3	2.7	1.8	2.8	3.4	4.1	3.5	1.6	1.7	2.9
	MP	2.6	2.7	2.3	3.9	4.8	5.2	3.6	1.7	1.7	3.3
LMH3	FS	2.3	2.0	1.8	2.7	3.3	3.6	3.4	1.8	1.8	3.3
	MP	2.8	2.3	2.2	4.1	4.6	5.3	3.7	1.7	1.7	3.6
LMH4	FS	2.0	1.8	3.0	3.0	4.1	4.2	2.9	2.3	2.5	2.1
	MP	1.8	2.4	3.1	3.7	4.6	5.2	2.0	2.3	2.4	1.6
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	2.2	2.2	2.9	2.1	2.4	2.1	2.4	2.3	1.9	1.2
	MP	1.5	1.5	2.4	2.4	2.4	2.0	2.6	2.2	1.8	1.2
LMH2	FS	2.4	1.7	2.2	2.2	2.7	1.6	1.5	1.6	2.1	1.7
	MP	2.8	1.8	2.0	2.9	3.6	1.7	1.6	1.5	2.2	1.8
LMH3	FS	2.6	1.9	2.4	2.2	3.3	1.7	1.4	1.5	1.3	1.5
	MP	3.2	1.5	2.2	3.7	3.7	1.6	1.4	1.3	1.4	1.5

LMH4	FS	2.4	1.9	2.2	1.8	2.4	1.5	1.5	1.2	1.4	1.6
	MP	1.5	1.2	2.1	1.9	2.4	1.4	1.6	1.2	1.4	1.6

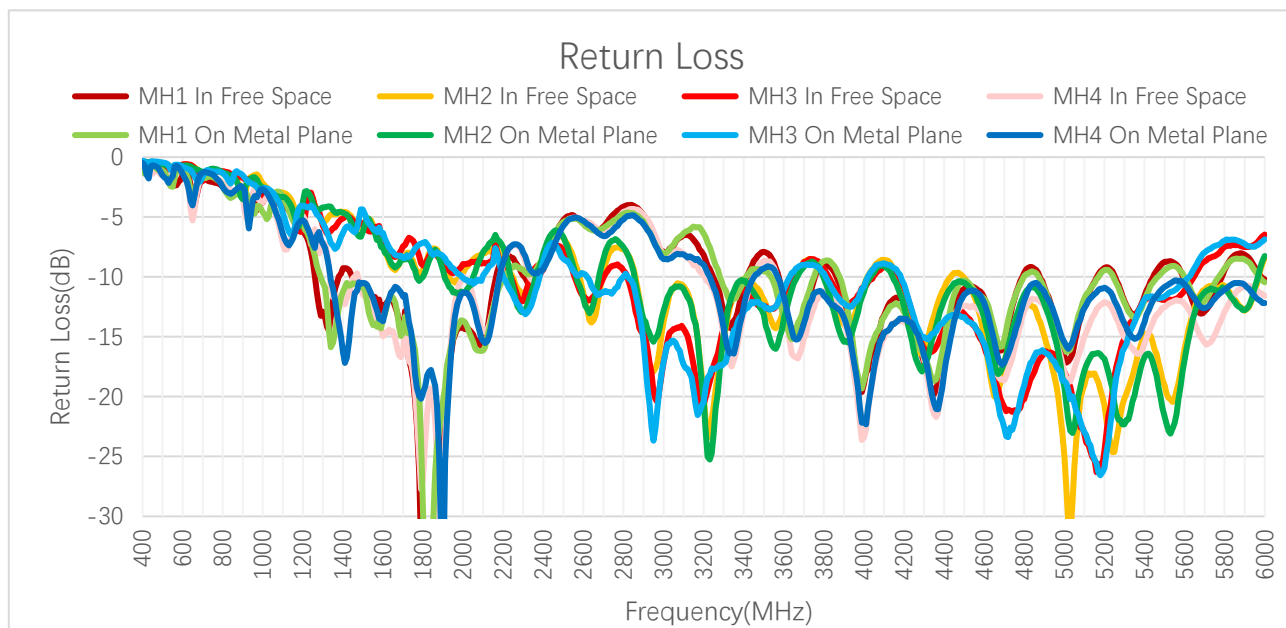
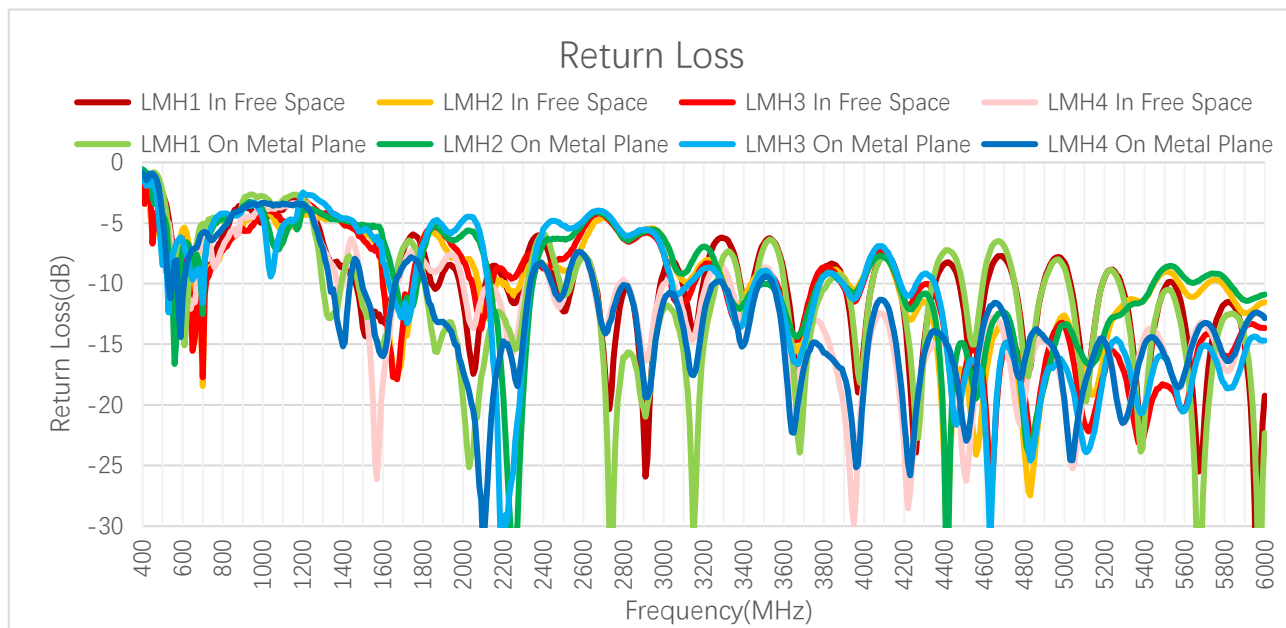
VSWR - MH

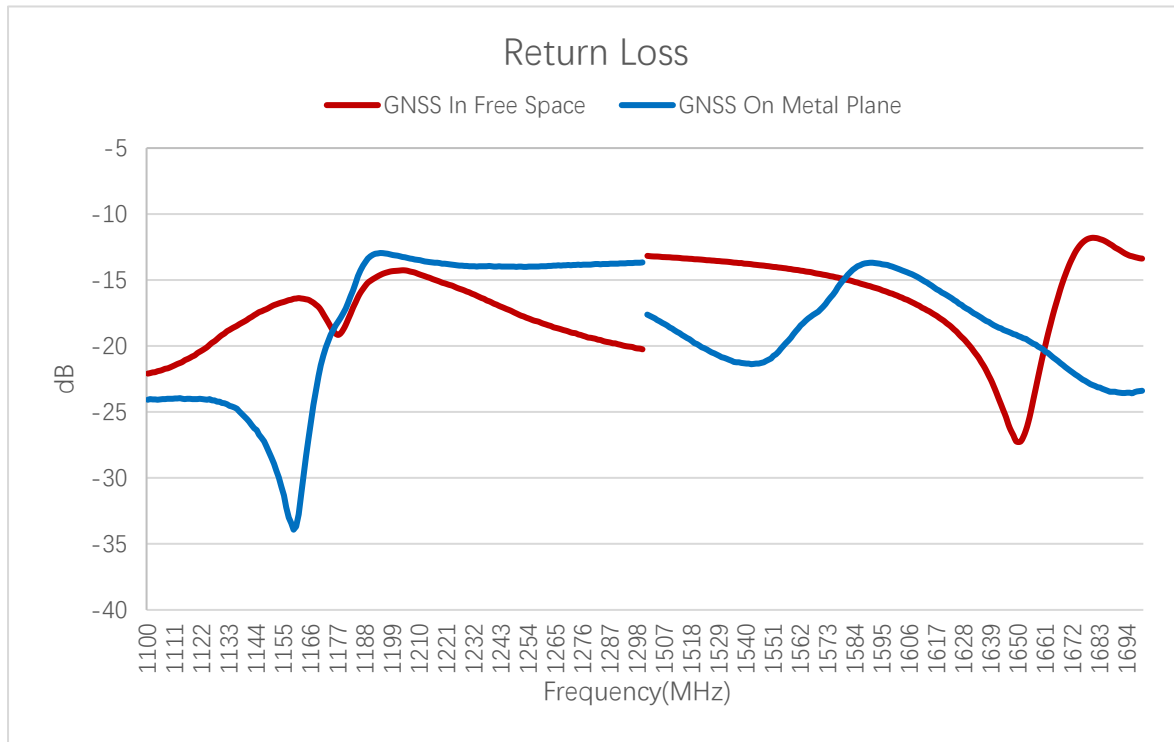
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	2.0	1.6	1.3	1.0
	MP	-	-	-	-	-	-	1.8	1.6	1.4	1.2
MH2	FS	-	-	-	-	-	-	3.6	2.2	2.2	2.3
	MP	-	-	-	-	-	-	3.3	2.2	2.2	2.2
MH3	FS	-	-	-	-	-	-	3.5	2.5	2.7	2.2
	MP	-	-	-	-	-	-	3.0	2.2	2.3	2.3
MH4	FS	-	-	-	-	-	-	1.8	1.5	1.3	1.1
	MP	-	-	-	-	-	-	1.5	1.7	1.5	1.1
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	1.4	1.7	1.8	2.7	3.3	1.7	1.4	1.3	2.2	1.9
	MP	1.4	1.5	2.0	2.7	3.2	1.5	1.4	1.4	2.0	1.9
MH2	FS	1.9	2.3	1.9	2.7	1.7	1.6	1.3	1.1	1.3	2.2
	MP	1.7	2.6	1.8	2.9	1.7	1.5	1.3	1.2	1.2	2.3
MH3	FS	2.0	2.2	2.0	2.5	1.7	1.7	1.2	1.3	1.7	2.8
	MP	2.1	2.1	1.7	2.6	2.0	1.8	1.2	1.3	1.7	2.7
MH4	FS	1.5	1.6	1.9	2.6	3.4	1.6	1.3	1.3	1.6	1.7
	MP	1.5	1.5	2.0	2.4	3.4	1.7	1.3	1.4	1.8	1.7

VSWR

Frequency (MHz)		1176	1227	1561	1575	1602
GNSS	FS	1.25	-	1.22	1.63	1.53
	MP	1.28	-	1.27	1.35	1.45

3.1.2. Return Loss





Return Loss (dB)

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	-5.9	-8.7	-8.2	-5.1	-3.7	-4.2	-9.1	-6.9	-6.1	-10.1
	MP	-13.4	-10.2	-5.3	-4.7	-3.2	-2.7	-8.1	-6.9	-6.5	-15.1
LMH2	FS	-5.5	-6.7	-10.6	-6.5	-5.2	-4.3	-5.1	-12.2	-11.5	-6.2
	MP	-7.2	-6.8	-8.0	-4.5	-3.6	-3.4	-4.9	-11.9	-11.9	-5.4
LMH3	FS	-8.1	-9.4	-11.0	-6.6	-5.5	-4.9	-5.3	-10.9	-10.6	-5.5
	MP	-6.5	-8.2	-8.4	-4.3	-3.8	-3.3	-4.8	-11.6	-12.2	-4.9
LMH4	FS	-9.3	-11.2	-6.1	-6.1	-4.3	-4.2	-6.3	-8.1	-7.3	-8.8
	MP	-11.2	-7.8	-5.7	-4.8	-3.8	-3.4	-9.3	-8.3	-7.8	-13.2
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	-8.6	-8.6	-6.3	-8.9	-7.7	-8.9	-7.9	-8.3	-10.4	-19.2
	MP	-13.6	-13.5	-7.6	-7.8	-7.7	-9.7	-6.9	-8.7	-10.6	-22.3
LMH2	FS	-7.7	-11.7	-8.4	-8.6	-6.7	-12.3	-13.9	-12.6	-9.0	-11.5
	MP	-6.5	-10.7	-9.6	-6.3	-4.9	-12.0	-12.3	-13.4	-8.7	-10.9
LMH3	FS	-6.9	-10.1	-7.6	-8.3	-5.4	-11.8	-15.2	-13.5	-18.4	-13.7
	MP	-5.7	-13.7	-8.7	-4.8	-4.8	-12.6	-15.1	-16.7	-16.1	-14.7

LMH4	FS	-7.7	-10.2	-8.5	-10.8	-7.7	-14.4	-14.3	-19.8	-15.7	-12.8
	MP	-14.5	-21.1	-9.1	-10.2	-7.6	-15.0	-12.6	-19.6	-16.0	-12.8

Return Loss (dB)

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	-9.8	-12.9	-17.6	-32.7
	MP	-	-	-	-	-	-	-10.7	-13.3	-14.8	-23.0
MH2	FS	-	-	-	-	-	-	-4.9	-8.5	-8.4	-8.1
	MP	-	-	-	-	-	-	-5.4	-8.5	-8.7	-8.4
MH3	FS	-	-	-	-	-	-	-5.1	-7.4	-6.8	-8.5
	MP	-	-	-	-	-	-	-6.0	-8.4	-8.2	-8.1
MH4	FS	-	-	-	-	-	-	-10.7	-13.5	-17.2	-29.8
	MP	-	-	-	-	-	-	-13.7	-11.5	-14.6	-24.5
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	-15.3	-12.1	-10.8	-6.8	-5.4	-11.8	-15.6	-16.6	-8.7	-10.2
	MP	-15.2	-13.5	-9.7	-6.6	-5.6	-13.5	-15.2	-15.9	-9.4	-10.4
MH2	FS	-10.3	-7.9	-9.9	-6.8	-11.4	-12.6	-17.2	-25.0	-19.1	-8.4
	MP	-11.3	-7.1	-10.8	-6.2	-11.8	-13.5	-17.1	-19.2	-21.7	-8.3
MH3	FS	-9.7	-8.7	-9.4	-7.5	-11.7	-11.4	-20.9	-18.0	-11.9	-6.5
	MP	-9.3	-9.0	-11.8	-7.1	-9.7	-11.1	-22.6	-18.7	-11.6	-6.9
MH4	FS	-13.4	-13.3	-10.4	-7.1	-5.3	-12.4	-18.7	-17.9	-12.5	-11.6
	MP	-14.5	-14.1	-9.7	-7.6	-5.3	-11.6	-17.2	-15.5	-10.8	-12.2

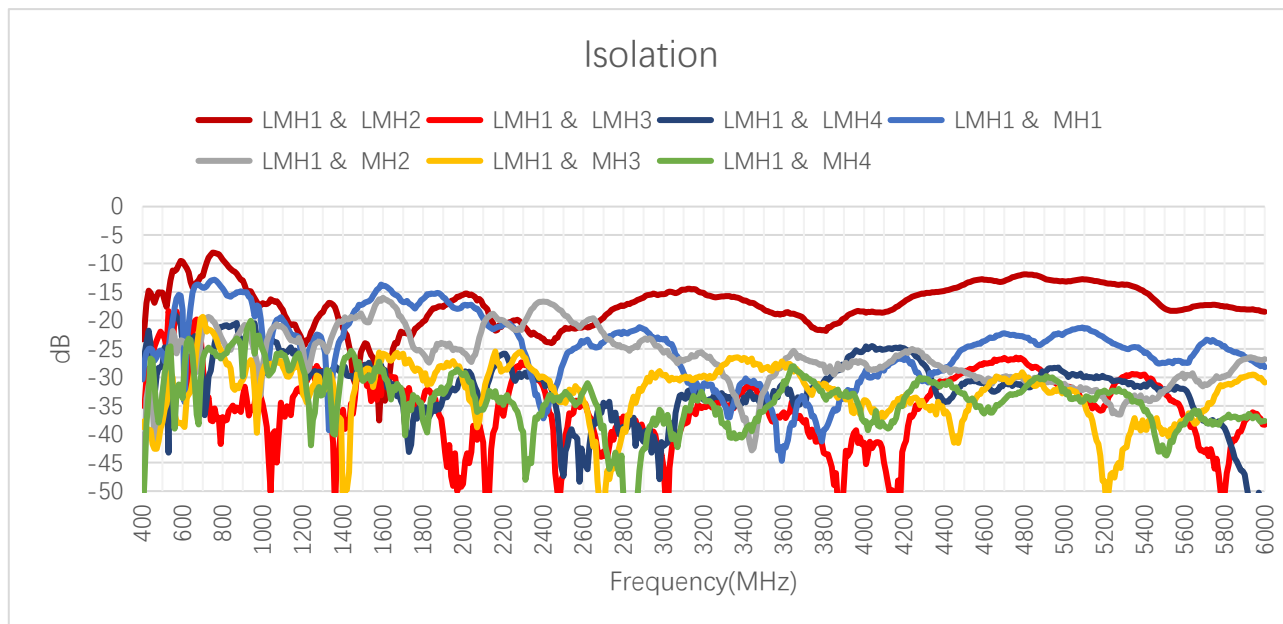
Return Loss (dB)

Frequency (MHz)		1176	1227	1561	1575	1602
GNSS	FS	-19	-	-14.2	-14.7	-16.2
	MP	-18.4	-	-18.6	-16.1	-14.2

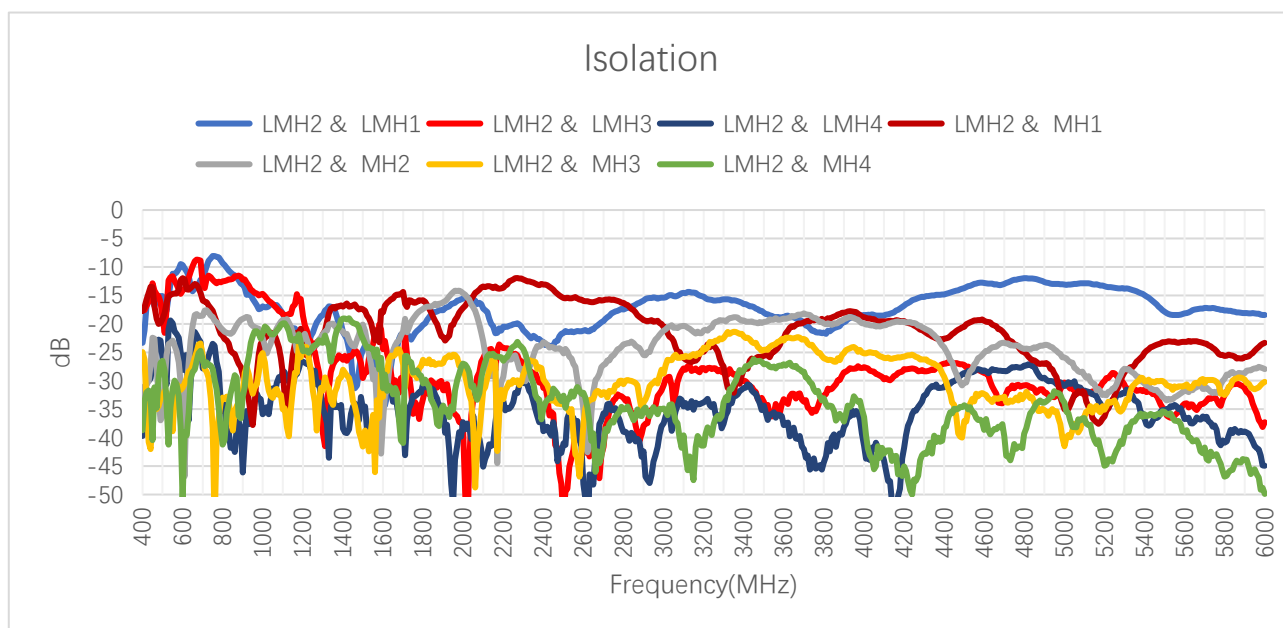
3.1.3. Isolation

3.1.3.1. Test Status: In Free Space

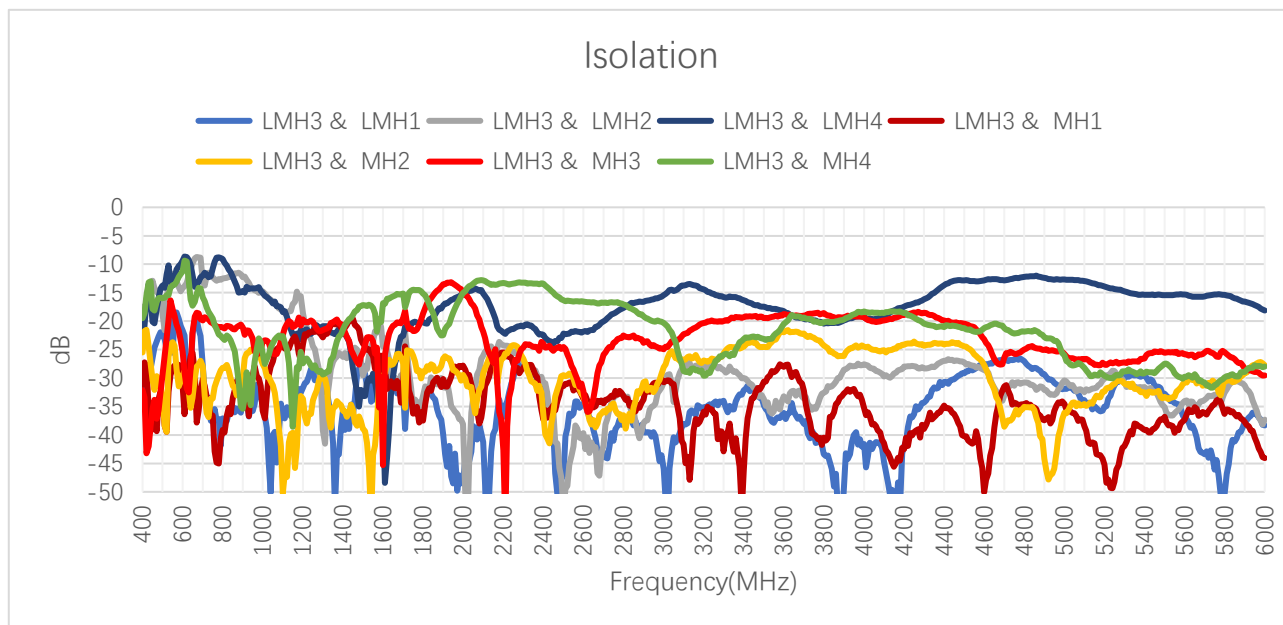
3.1.3.1.1. LMH1



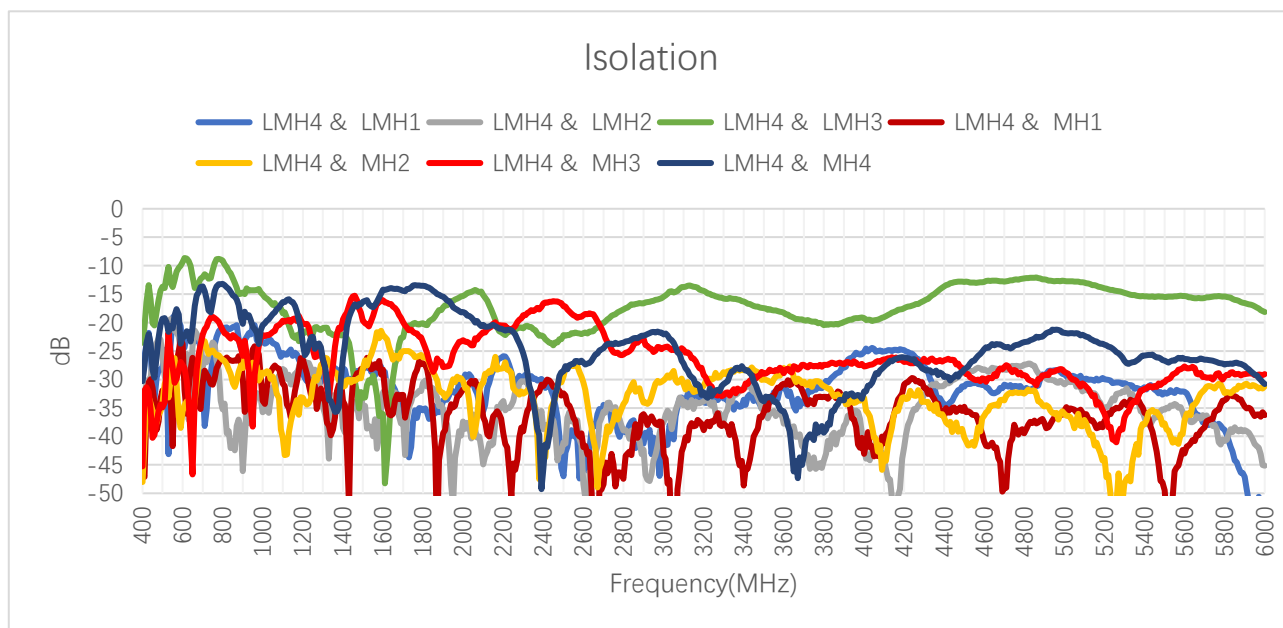
3.1.3.1.2. LMH2



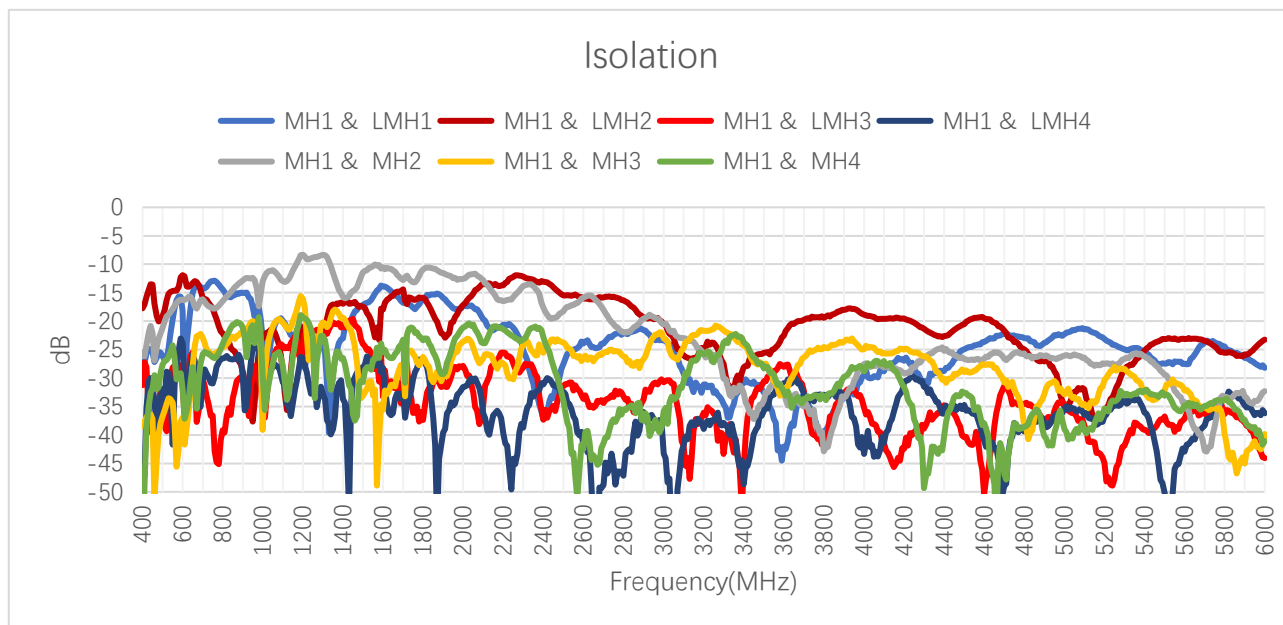
3.1.3.1.3. LMH3



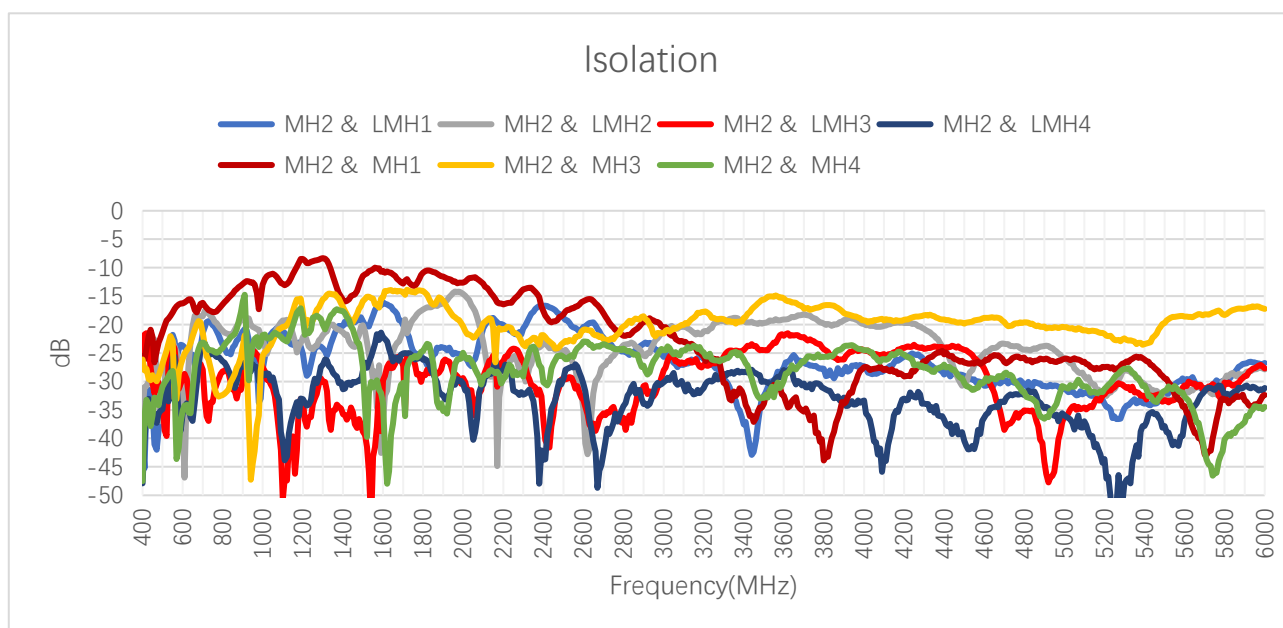
3.1.3.1.4. LMH4



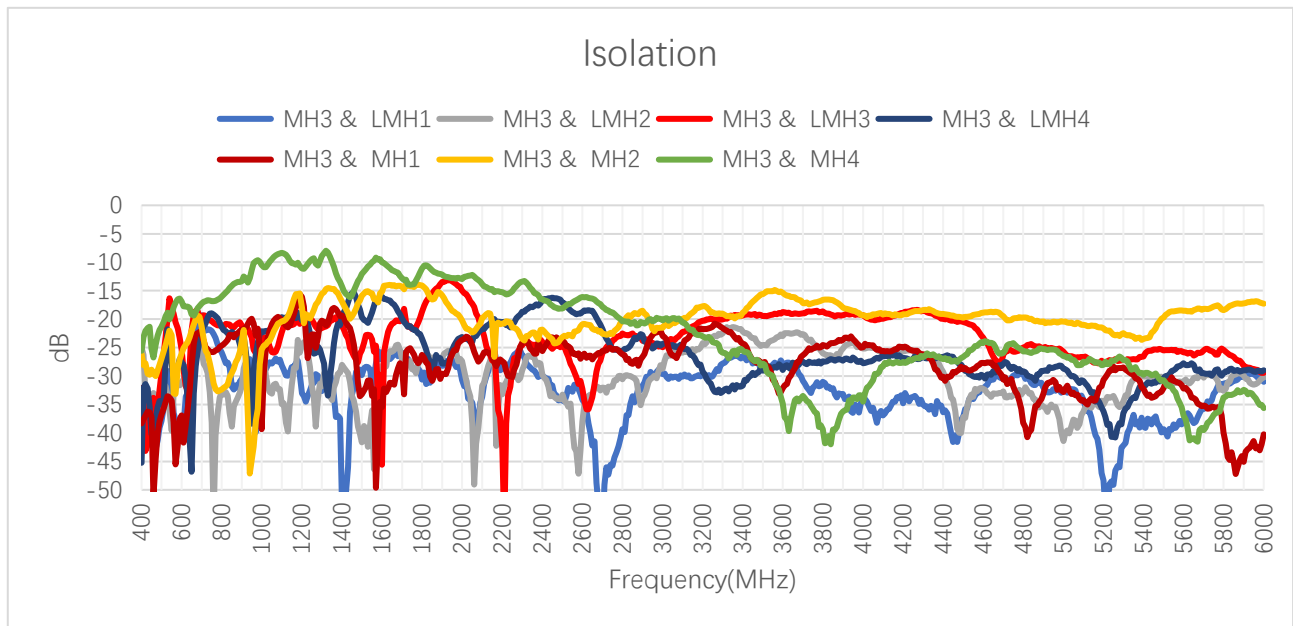
3.1.3.1.5. MH1



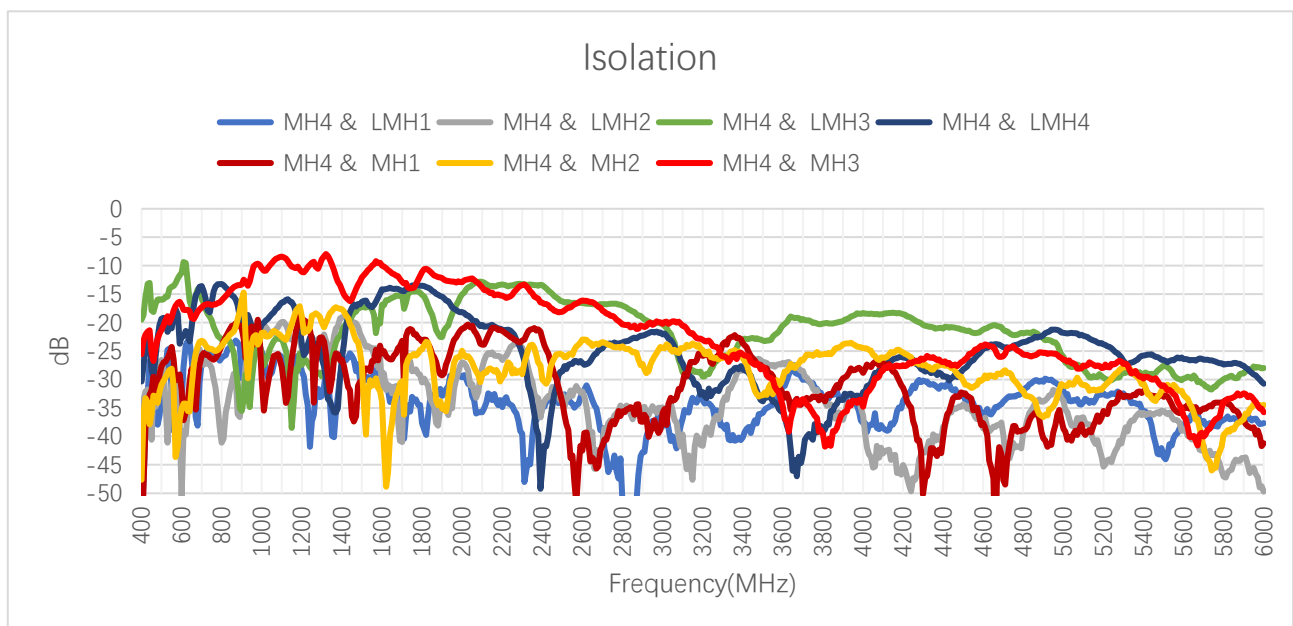
3.1.3.1.6. MH2



3.1.3.1.7. MH3

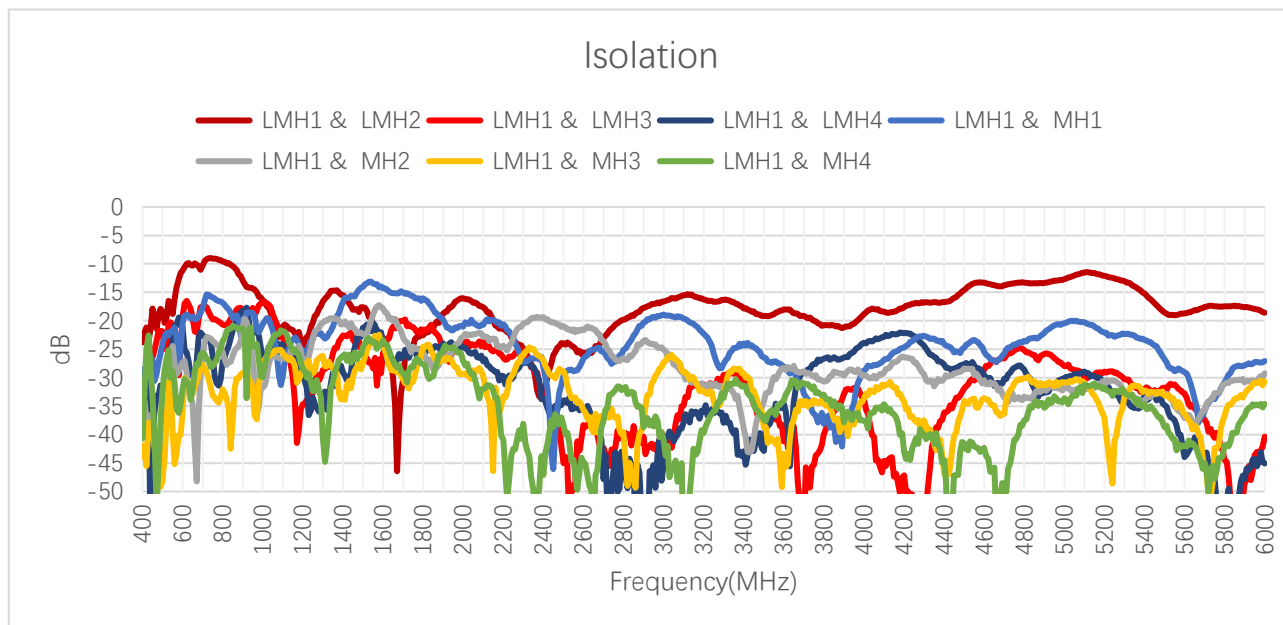


3.1.3.1.8. MH4

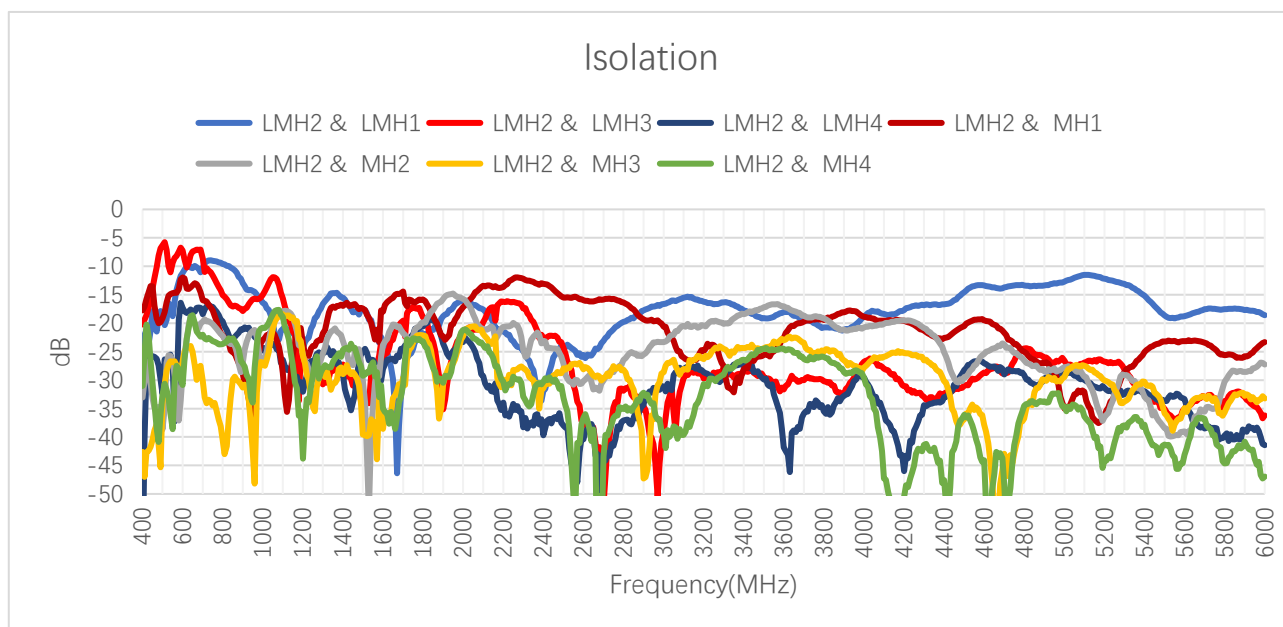


3.1.3.2. Test Status: On 500 × 500 mm Metal Plane

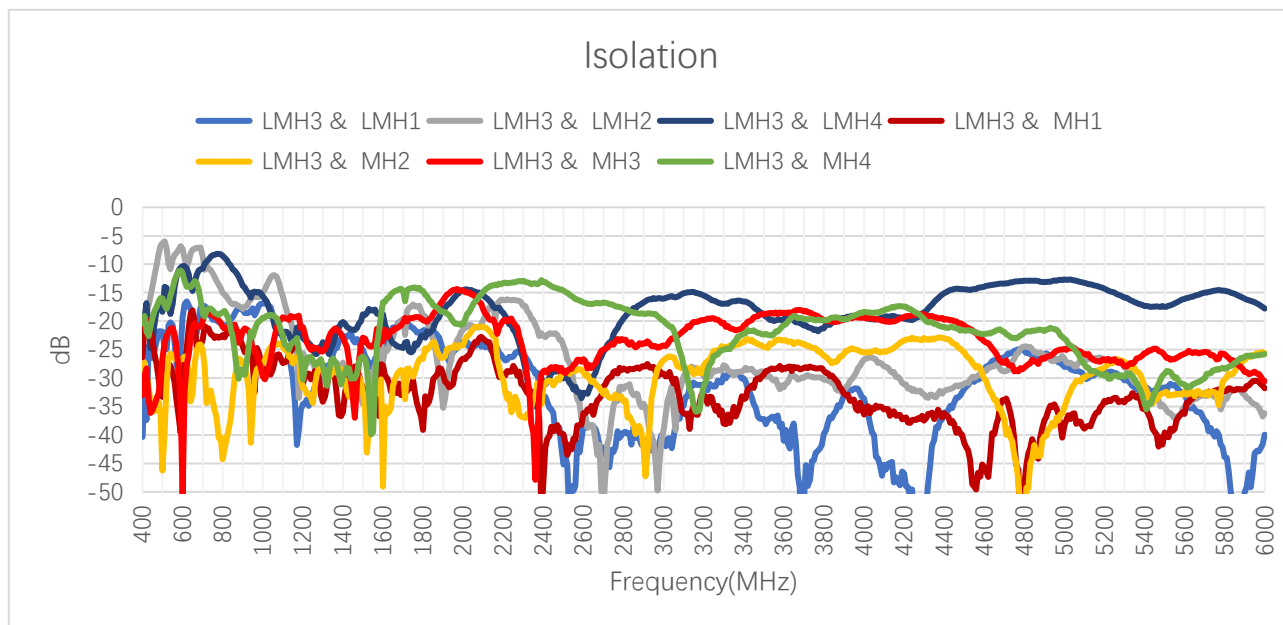
3.1.3.2.1. LMH1



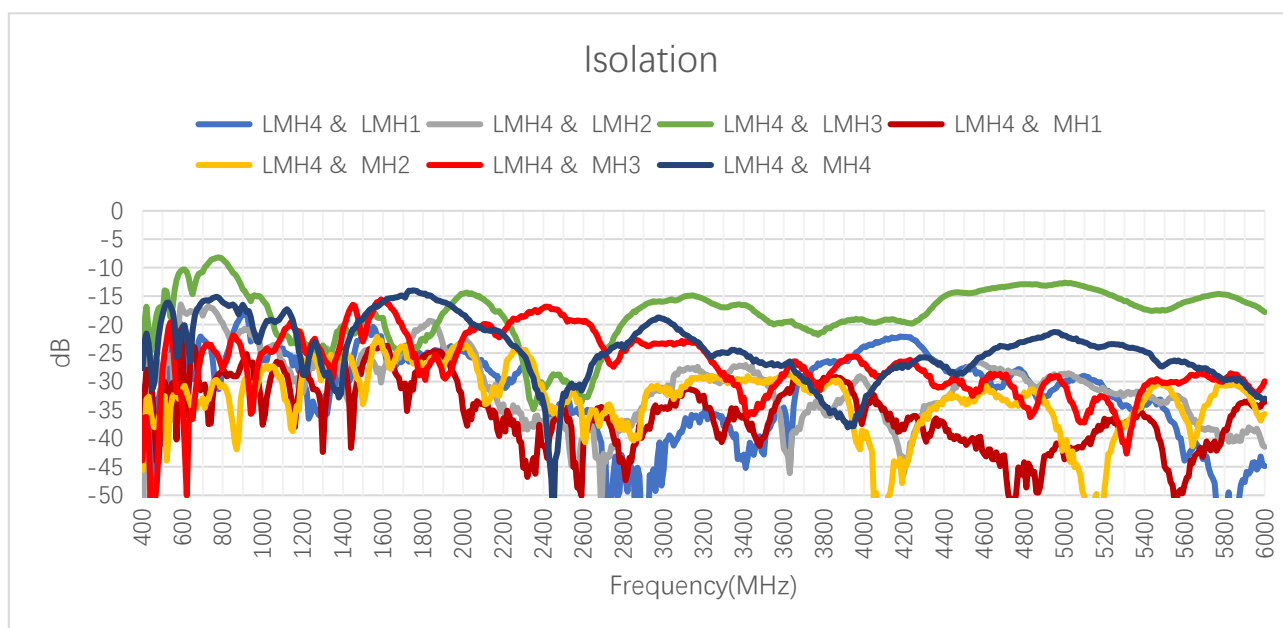
3.1.3.2.2. LMH2



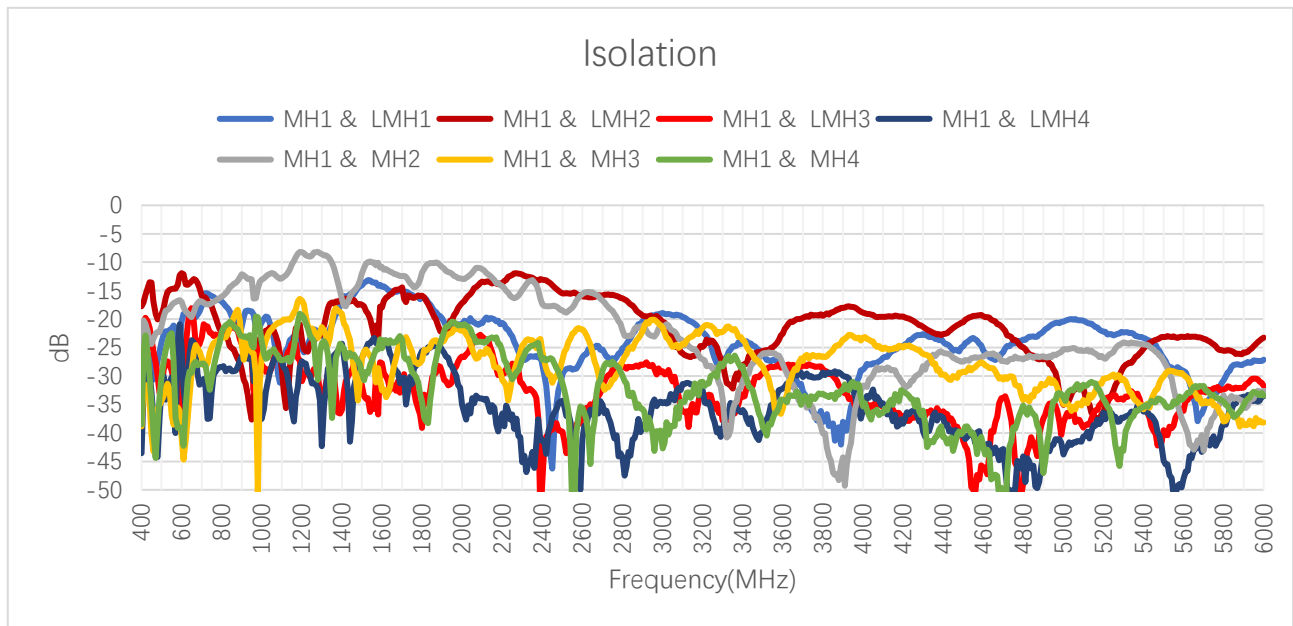
3.1.3.2.3. LMH3



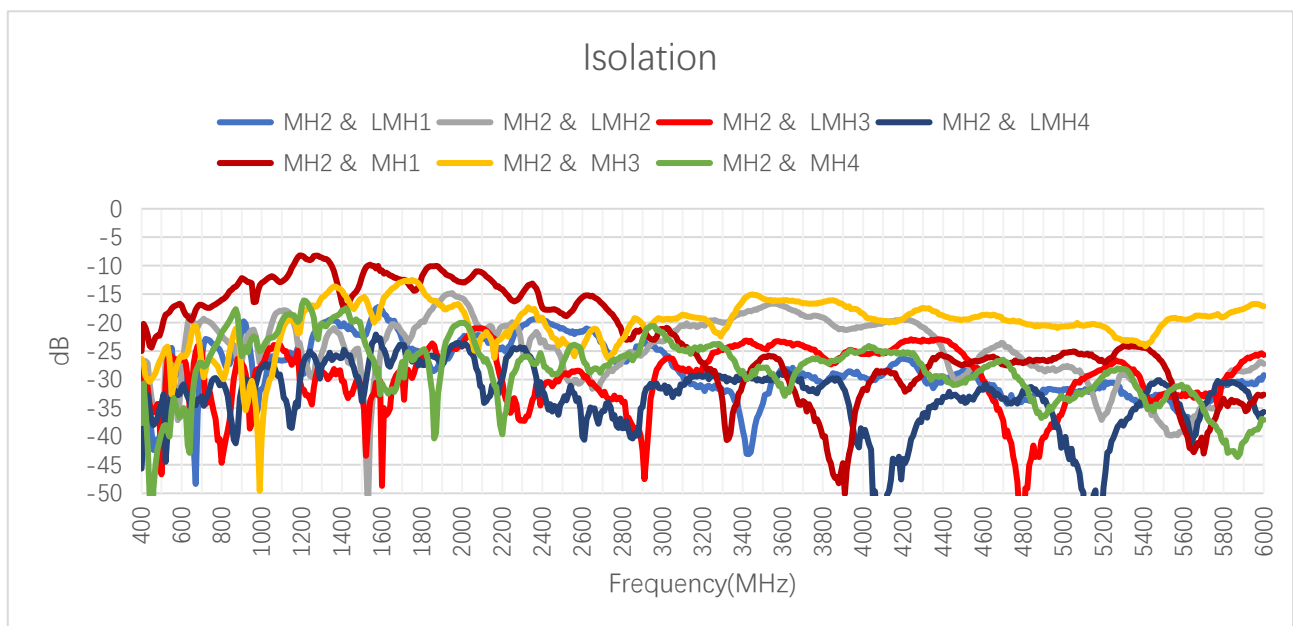
3.1.3.2.4. LMH4



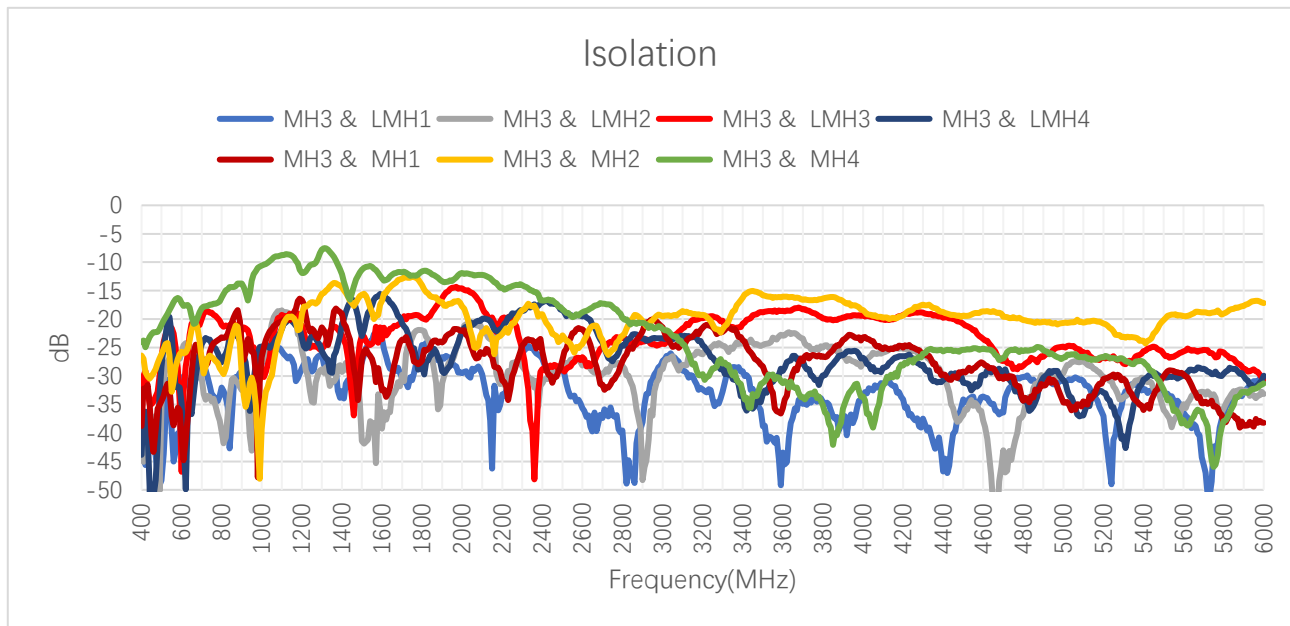
3.1.3.2.5. MH1



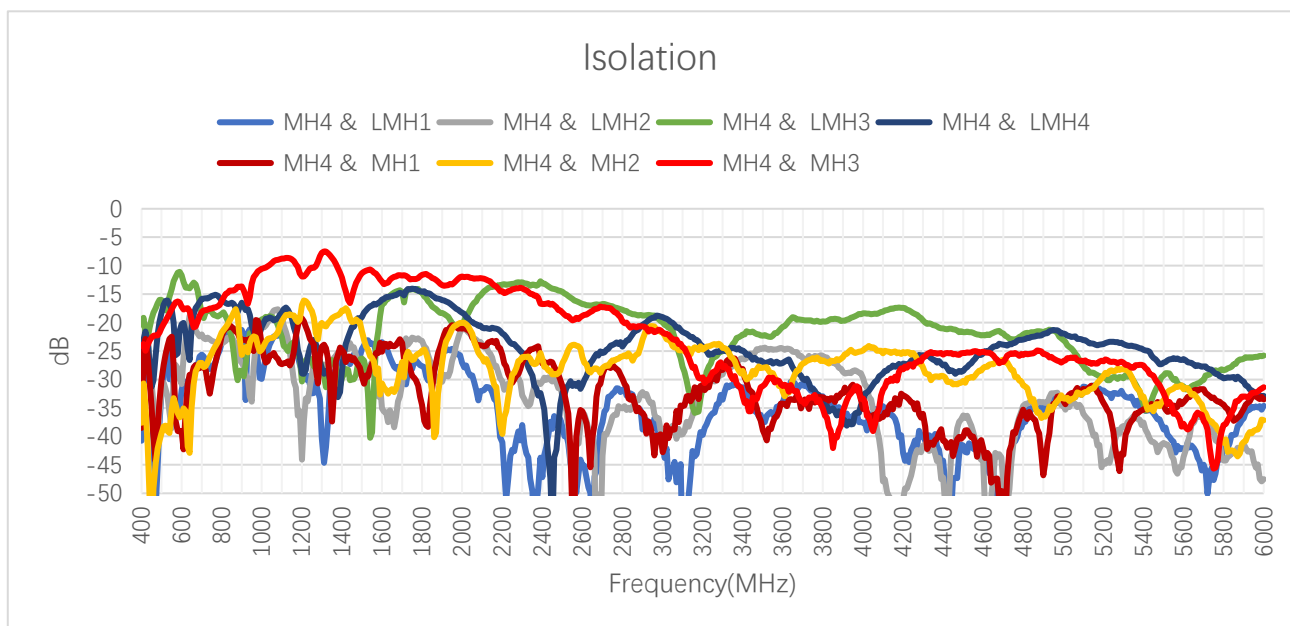
3.1.3.2.6. MH2



3.1.3.2.7. MH3

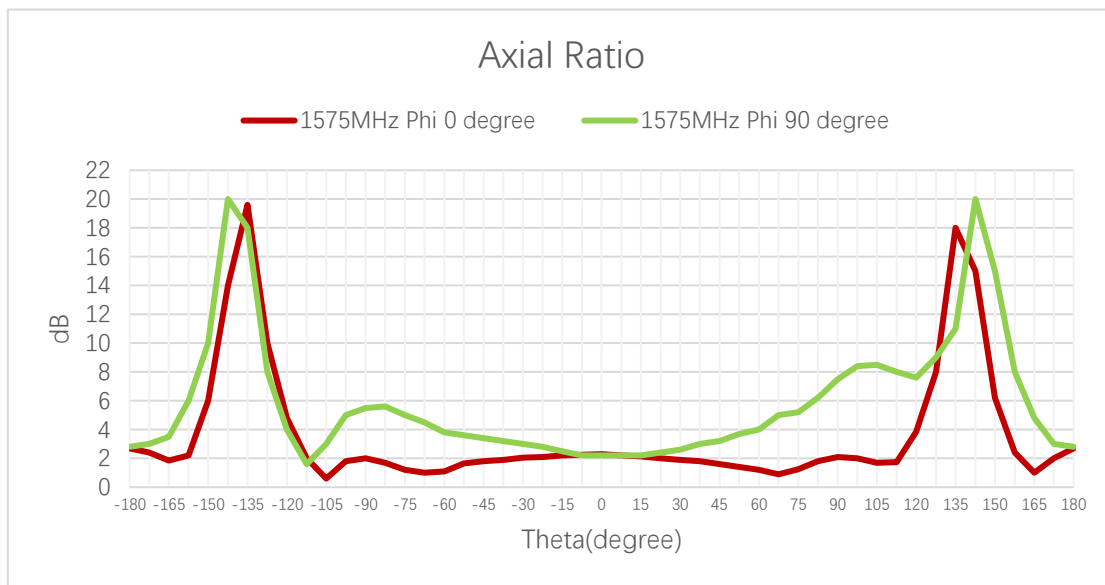
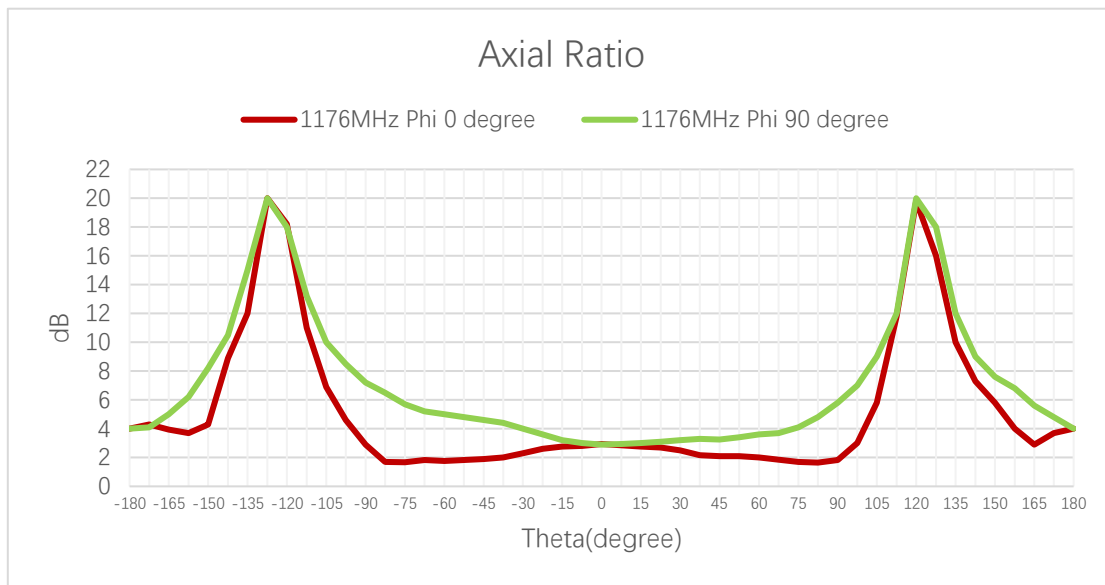


3.1.3.2.8. MH4



- FS: In Free Space
- MP: On 500 × 500 mm Metal Plane

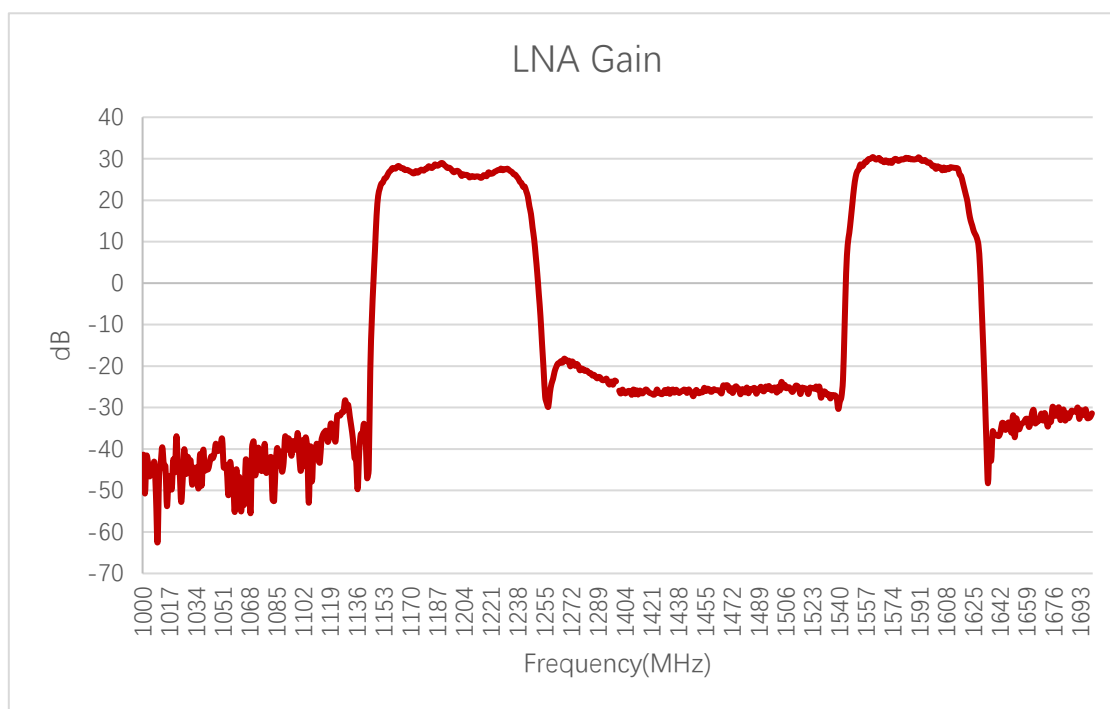
3.1.4. GNSS Axial Ratio



Axial Ratio (dB)

Frequency (MHz)		1176	1227	1575
GNSS	Phi = 0 (deg) Theta = 0 (deg)	2.8	-	2.2
	Phi = 90 (deg) Theta = 0 (deg)	2.8	-	2.2

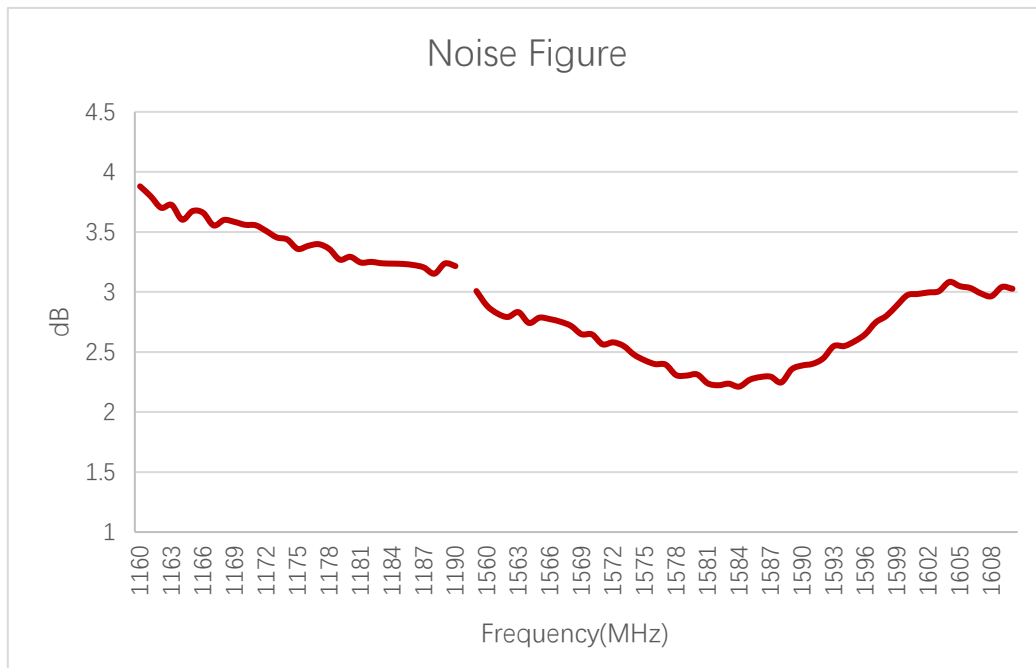
3.1.5. GNSS LNA Gain



LNA Gain (dB)

Frequency (MHz)	1176	1227	1561	1575	1602
GNSS	27.3	-	30	29.9	28

3.1.6. GNSS Noise Figure

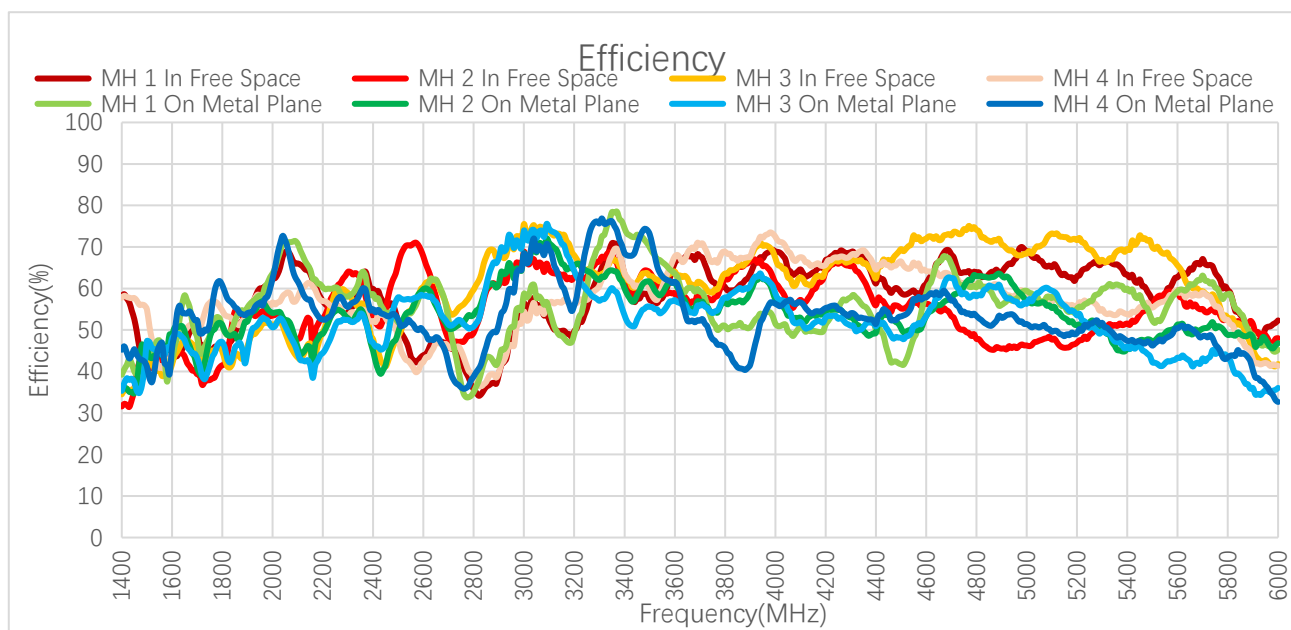
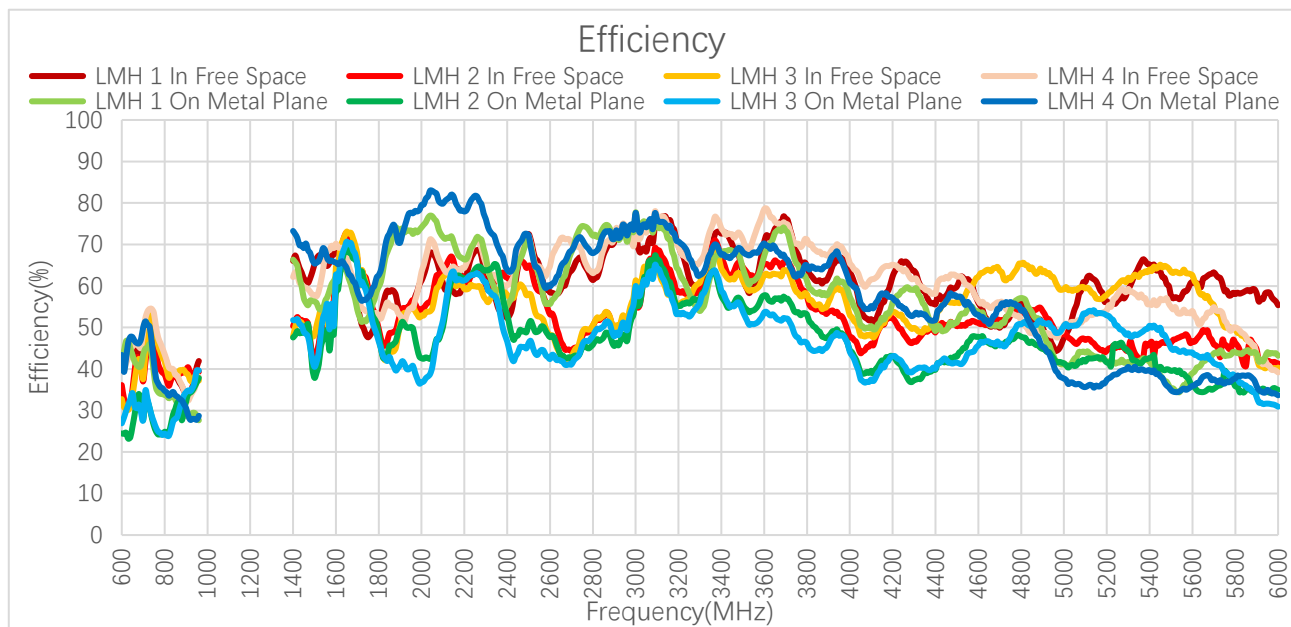


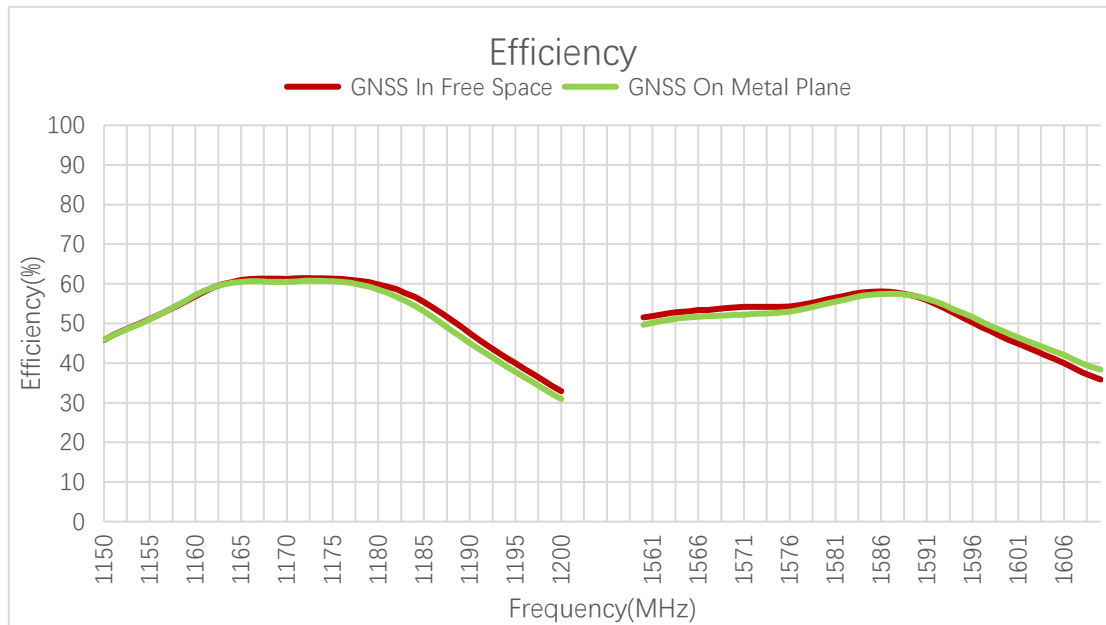
Noise Figure (dB)

Frequency (MHz)	1176	1227	1561	1575	1602
Noise Figure (dB)	3.38	-	2.8	2.43	2.9

3.2. Radiation Performance Test

3.2.1. Efficiency





Efficiency (%)

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	42.9	42.9	48.5	39.7	34.3	41.9	63.2	53.1	48.3	57.8
	MP	42.2	46.8	44.9	33.4	28.9	27.7	59.9	52.6	51.5	74.1
LMH2	FS	36.1	31.0	41.4	37.3	39.8	39.3	51.8	60.6	62.0	49.2
	MP	24.5	23.2	33.6	26.7	32.1	37.8	48.9	62.0	60.3	46.8
LMH3	FS	32.8	30.1	43.7	38.8	39.0	37.2	51.2	60.2	60.7	45.2
	MP	26.9	31.4	34.8	25.4	34.4	39.7	50.5	60.4	58.9	39.6
LMH4	FS	39.9	42.7	52.2	40.1	33.4	38.0	60.4	56.4	53.9	54.7
	MP	43.4	46.4	51.5	34.1	30.6	28.7	69.9	57.4	56.7	73.3
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	55.2	59.5	56.1	64.5	58.5	70.6	49.9	47.6	57.7	55.4
	MP	73.4	72.0	57.2	65.1	55.7	67.2	50.3	41.4	35.2	43.2
LMH2	FS	56.0	67.1	61.5	65.3	53.1	65.2	51.3	48.8	46.3	41.4
	MP	50.2	61.4	65.1	48.1	47.7	57.8	45.8	41.4	39.5	35.0
LMH3	FS	54.6	63.9	59.1	59.6	47.8	62.6	63.7	59.3	63.4	40.4
	MP	40.4	63.2	56.8	43.9	42.4	53.6	45.7	50.4	45.0	30.9

LMH4	FS	54.6	64.3	62.1	68.5	64.9	78.5	56.0	50.6	55.0	39.2
	MP	77.7	82.0	70.3	69.8	59.9	70.3	54.6	37.7	34.9	33.7

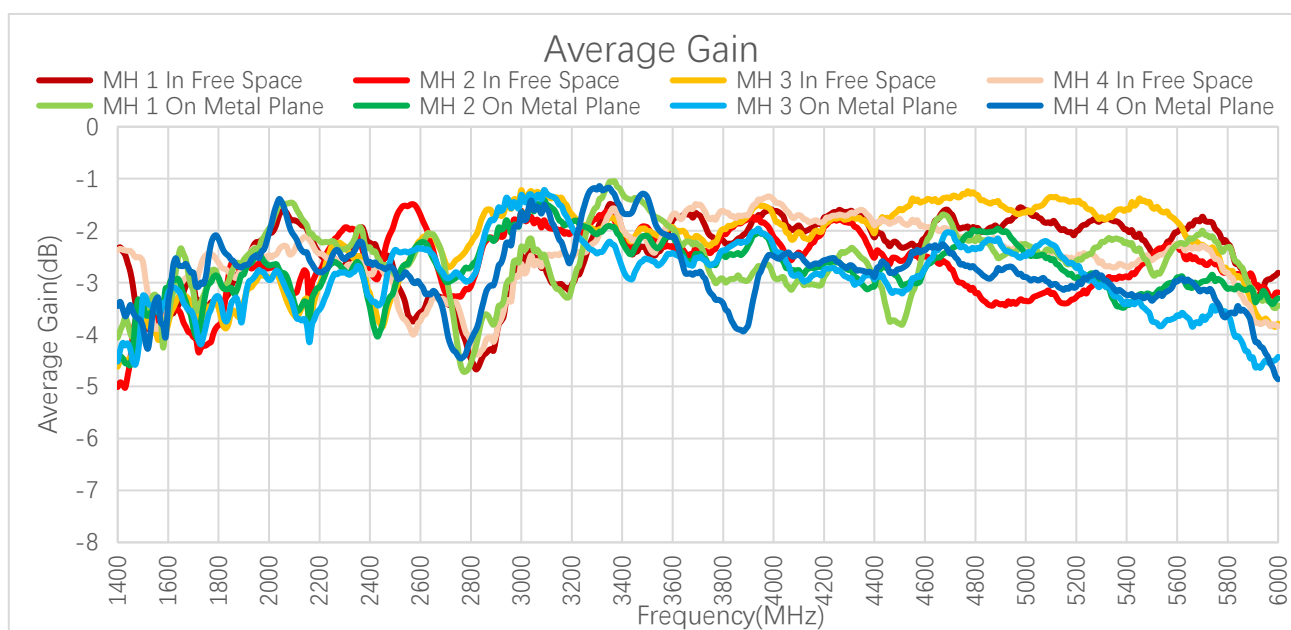
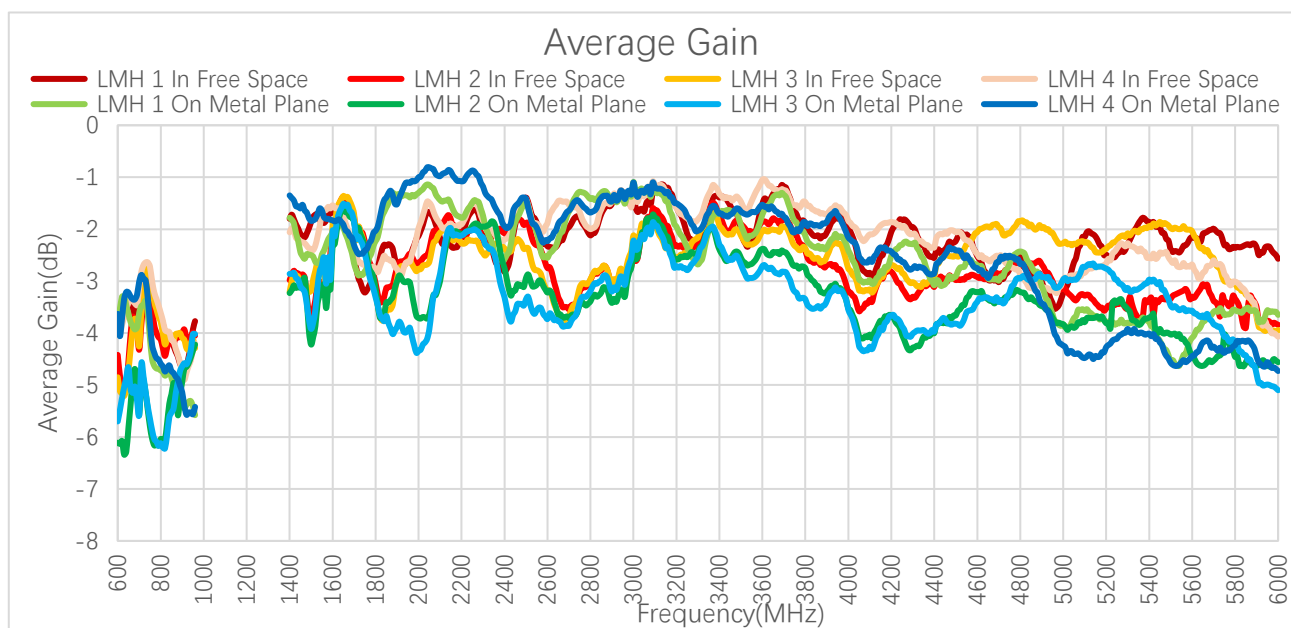
Efficiency (%)

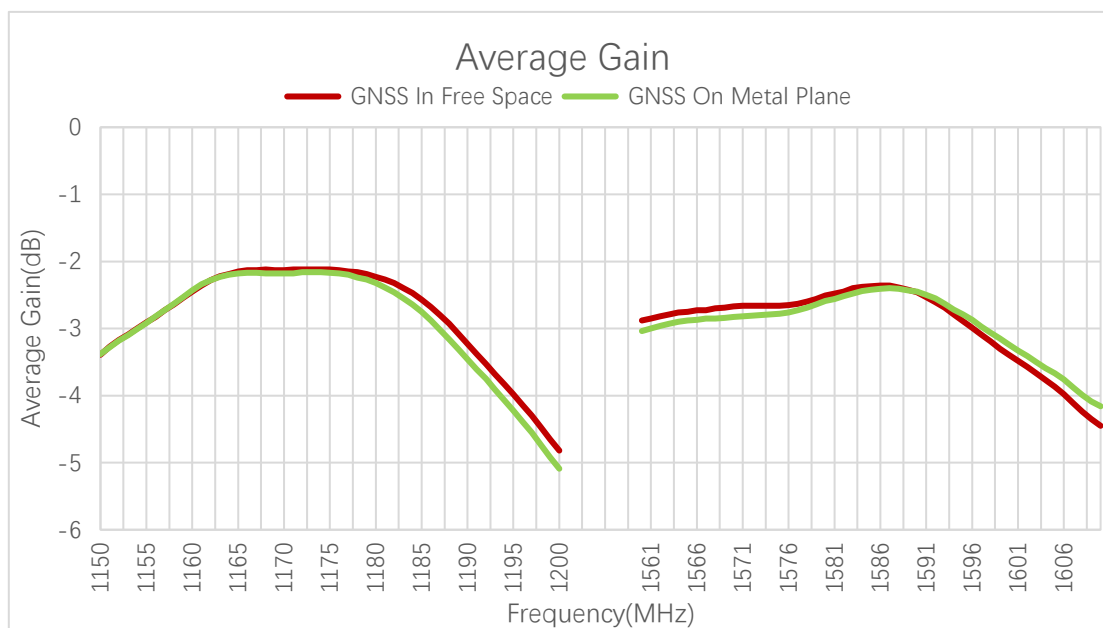
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	54.6	46.7	45.2	52.3
	MP	-	-	-	-	-	-	43.6	50.9	52.7	57.4
MH2	FS	-	-	-	-	-	-	33.2	39.1	37.9	53.3
	MP	-	-	-	-	-	-	45.8	49.8	51.7	54.7
MH3	FS	-	-	-	-	-	-	35.7	44.4	43.5	43.0
	MP	-	-	-	-	-	-	40.8	43.5	47.1	50.7
MH4	FS	-	-	-	-	-	-	57.7	50.2	55.9	52.2
	MP	-	-	-	-	-	-	42.4	56.0	61.8	55.6
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	60.0	64.4	62.0	55.8	43.9	66.1	68.2	69.0	57.2	52.3
	MP	63.6	61.0	58.6	51.8	62.2	60.0	60.9	57.1	54.5	45.3
MH2	FS	54.1	53.0	62.9	54.6	67.7	58.9	53.4	46.3	55.9	48.0
	MP	54.1	48.9	44.9	49.5	55.8	55.6	60.5	56.4	49.2	46.8
MH3	FS	50.5	46.5	56.4	41.2	60.4	64.1	72.8	68.4	69.9	41.8
	MP	50.6	44.0	46.9	57.9	56.7	55.1	58.9	59.1	42.0	36.0
MH4	FS	58.4	61.3	54.4	52.8	42.3	67.7	62.9	57.9	55.4	41.4
	MP	62.5	52.7	55.0	52.4	48.3	52.2	54.4	50.6	47.9	32.7

Efficiency (%)

Frequency (MHz)		1176	1227	1561	1575	1602
GNSS	FS	61.2	-	51.9	54.2	43.9
	MP	60.5	-	50.1	52.8	45.6

3.2.2. Average Gain





Average Gain (dB)

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	-3.7	-3.7	-3.1	-4.0	-4.7	-3.8	-2.0	-2.8	-3.2	-2.4
	MP	-3.7	-3.3	-3.5	-4.8	-5.4	-5.6	-2.2	-2.8	-2.9	-1.3
LMH2	FS	-4.4	-5.1	-3.8	-4.3	-4.0	-4.1	-2.9	-2.2	-2.1	-3.1
	MP	-6.1	-6.3	-4.7	-5.7	-4.9	-4.2	-3.1	-2.1	-2.2	-3.3
LMH3	FS	-4.9	-5.2	-3.6	-4.1	-4.1	-4.3	-2.9	-2.2	-2.2	-3.5
	MP	-5.7	-5.0	-4.6	-6.0	-4.6	-4.0	-3.0	-2.2	-2.3	-4.0
LMH4	FS	-4.0	-3.7	-2.8	-4.0	-4.8	-4.2	-2.2	-2.5	-2.7	-2.6
	MP	-3.6	-3.3	-2.9	-4.7	-5.1	-5.4	-1.6	-2.4	-2.5	-1.4
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	-2.6	-2.3	-2.5	-1.9	-2.3	-1.5	-3.0	-3.2	-2.4	-2.6
	MP	-1.4	-1.4	-2.4	-1.9	-2.6	-1.7	-3.0	-3.8	-4.5	-3.7
LMH2	FS	-2.5	-1.7	-2.1	-1.9	-2.8	-1.9	-2.9	-3.1	-3.3	-3.8
	MP	-3.0	-2.1	-1.9	-3.2	-3.2	-2.4	-3.4	-3.8	-4.0	-4.6
LMH3	FS	-2.6	-2.0	-2.3	-2.3	-3.2	-2.0	-2.0	-2.3	-2.0	-3.9
	MP	-3.9	-2.0	-2.5	-3.6	-3.7	-2.7	-3.4	-3.0	-3.5	-5.1

LMH4	FS	-2.6	-1.9	-2.1	-1.6	-1.9	-1.1	-2.5	-3.0	-2.6	-4.1
	MP	-1.1	-0.9	-1.5	-1.6	-2.2	-1.5	-2.6	-4.2	-4.6	-4.7

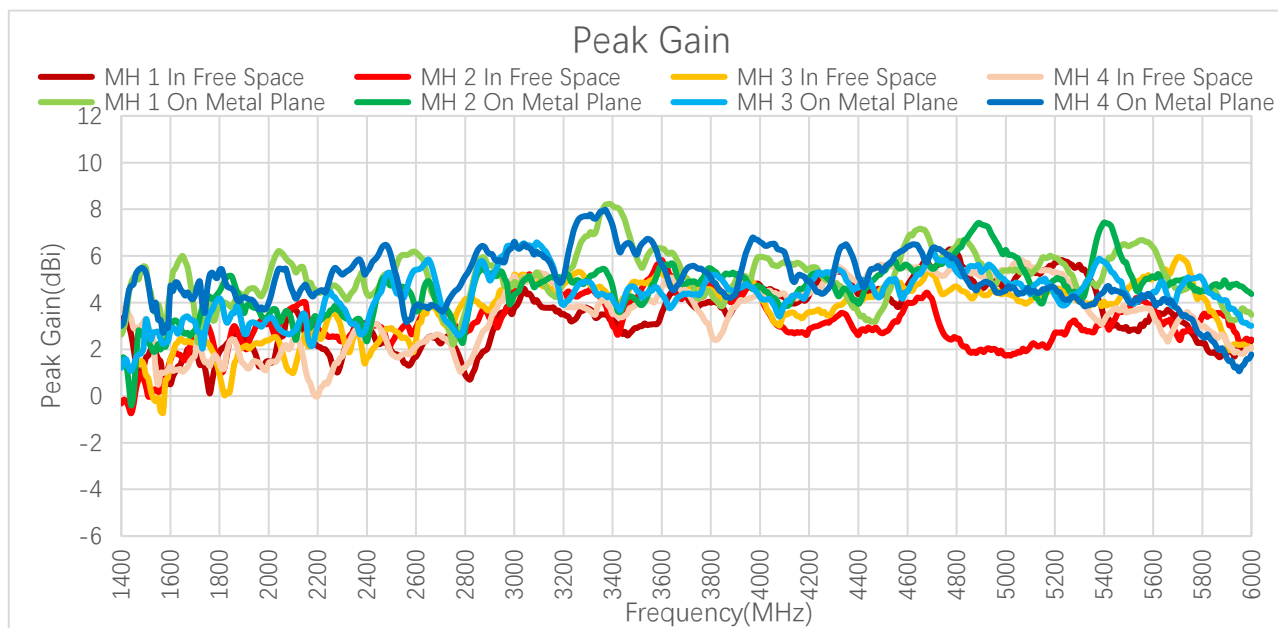
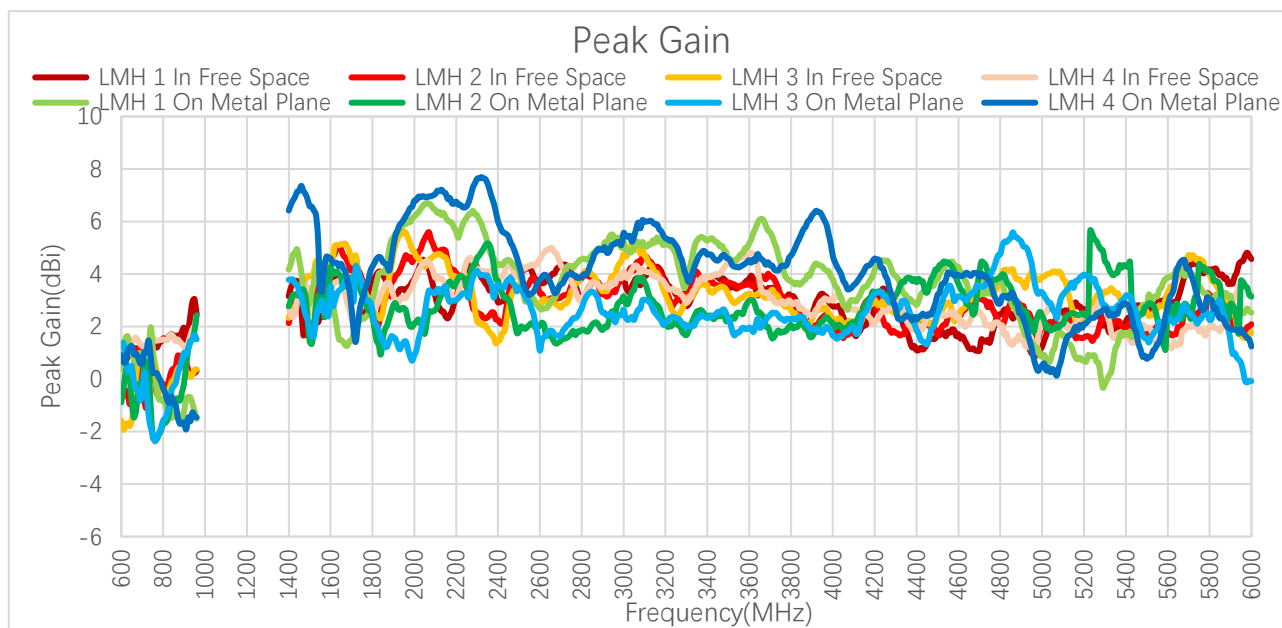
Average Gain (dB)

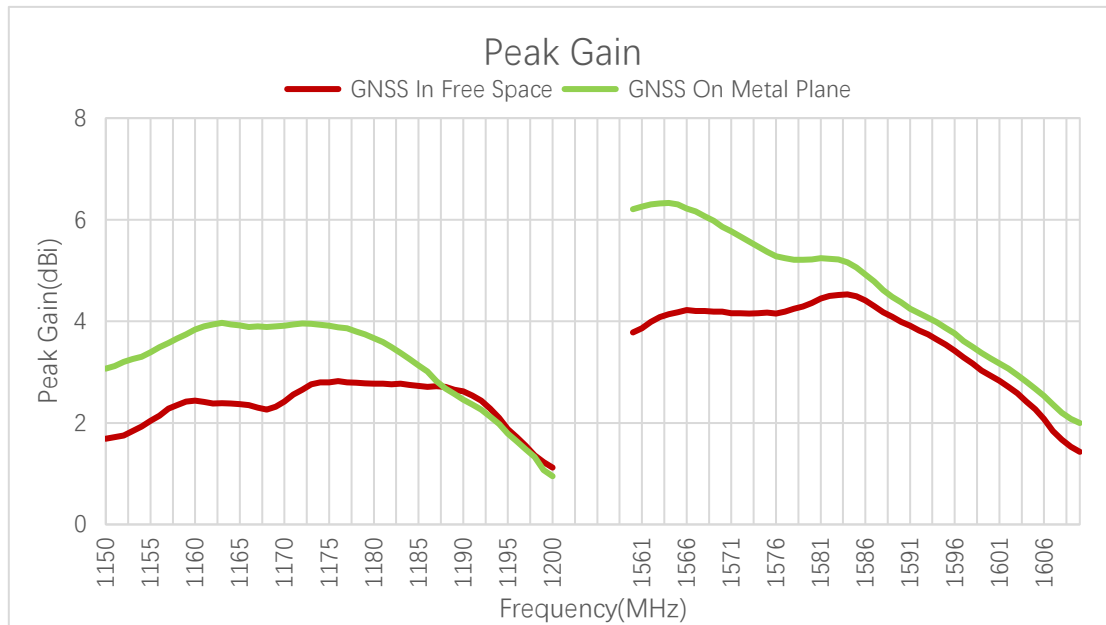
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	-2.6	-3.3	-3.5	-2.8
	MP	-	-	-	-	-	-	-3.6	-2.9	-2.8	-2.4
MH2	FS	-	-	-	-	-	-	-4.8	-4.1	-4.2	-2.7
	MP	-	-	-	-	-	-	-3.4	-3.0	-2.9	-2.6
MH3	FS	-	-	-	-	-	-	-4.5	-3.5	-3.6	-3.7
	MP	-	-	-	-	-	-	-3.9	-3.6	-3.3	-3.0
MH4	FS	-	-	-	-	-	-	-2.4	-3.0	-2.5	-2.8
	MP	-	-	-	-	-	-	-3.7	-2.5	-2.1	-2.6
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	-2.2	-1.9	-2.1	-2.5	-3.6	-1.8	-1.7	-1.6	-2.4	-2.8
	MP	-2.0	-2.2	-2.3	-2.9	-2.1	-2.2	-2.2	-2.4	-2.6	-3.4
MH2	FS	-2.7	-2.8	-2.0	-2.6	-1.7	-2.3	-2.7	-3.4	-2.5	-3.2
	MP	-2.7	-3.1	-3.5	-3.1	-2.5	-2.6	-2.2	-2.5	-3.1	-3.3
MH3	FS	-3.0	-3.3	-2.5	-3.9	-2.2	-1.9	-1.4	-1.7	-1.6	-3.8
	MP	-3.0	-3.6	-3.3	-2.4	-2.5	-2.6	-2.3	-2.3	-3.8	-4.4
MH4	FS	-2.3	-2.1	-2.6	-2.8	-3.7	-1.7	-2.0	-2.4	-2.6	-3.8
	MP	-2.0	-2.8	-2.6	-2.8	-3.2	-2.8	-2.6	-3.0	-3.2	-4.9

Average Gain (dB)

Frequency (MHz)		1176	1227	1561	1575	1602
GNSS	FS	-2.1	-	-2.9	-2.7	-3.6
	MP	-2.2	-	-3.0	-2.8	-3.4

3.2.3. Peak Gain





Peak Gain (dBi)

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	0.9	0.8	1.2	1.7	1.9	2.5	3.7	2.3	2.3	3.4
	MP	0.4	1.6	0.7	-1.4	-1.2	-1.5	4.9	1.7	2.2	4.9
LMH2	FS	-0.7	-0.5	-0.9	0.0	0.7	0.3	3.2	4.6	4.0	3.3
	MP	-0.9	0.5	0.6	-1.2	-0.2	2.4	3.2	3.7	3.5	2.3
LMH3	FS	-1.6	-1.7	0.9	-0.4	0.4	0.4	3.0	4.4	3.9	3.9
	MP	1.3	0.3	0.3	-0.9	1.0	1.5	3.6	2.9	3.9	1.4
LMH4	FS	1.1	1.1	1.2	1.7	1.2	2.1	3.0	2.2	2.6	3.7
	MP	0.9	1.0	1.0	-0.9	-1.7	-1.5	7.1	1.9	2.7	4.1
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	3.4	2.6	3.5	3.2	3.6	3.8	1.1	1.2	2.6	4.6
	MP	5.9	6.3	5.2	4.5	2.7	5.2	3.2	0.9	2.8	2.5
LMH2	FS	4.5	4.9	2.4	3.1	3.3	3.6	3.1	2.0	1.7	2.1
	MP	2.7	3.4	5.2	3.0	2.0	3.0	4.1	2.4	2.8	3.1
LMH3	FS	5.6	4.7	1.9	2.7	2.8	3.2	3.9	3.9	2.6	1.8
	MP	1.4	3.5	3.9	3.8	1.1	2.0	3.5	3.3	1.5	-0.1

LMH4	FS	3.1	3.7	4.1	4.4	4.6	4.8	2.6	2.2	2.0	3.3
	MP	6.1	7.1	7.5	5.4	3.8	4.5	3.9	0.5	0.8	1.2

Peak Gain (dBi)

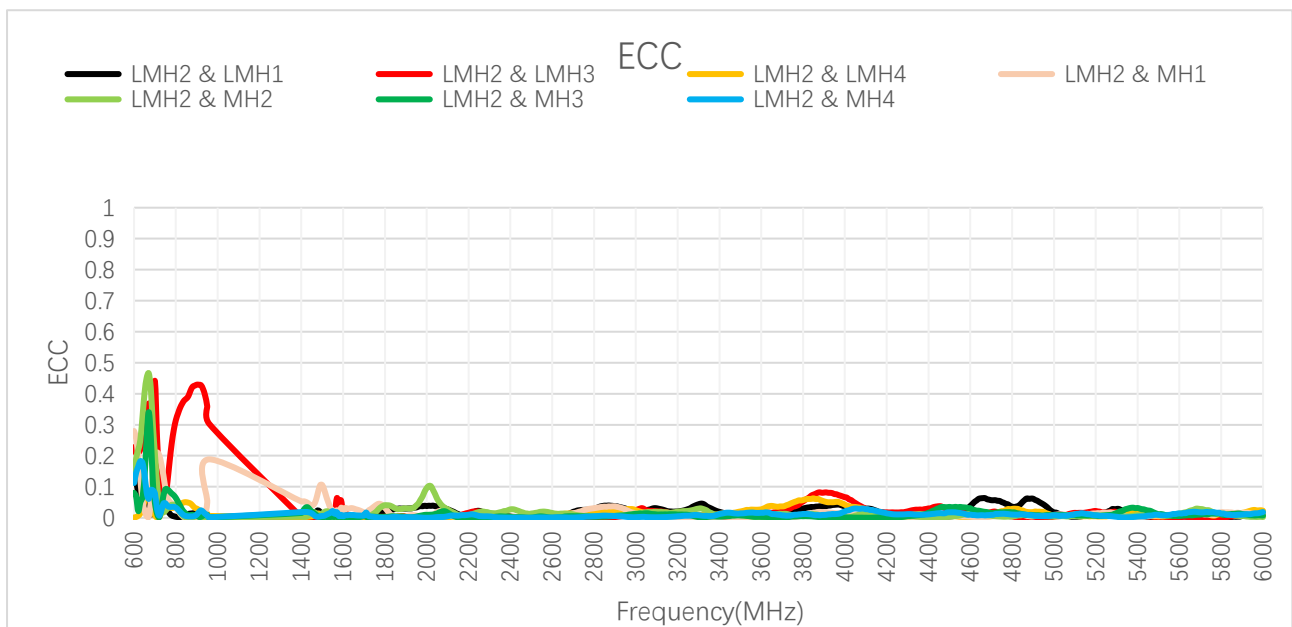
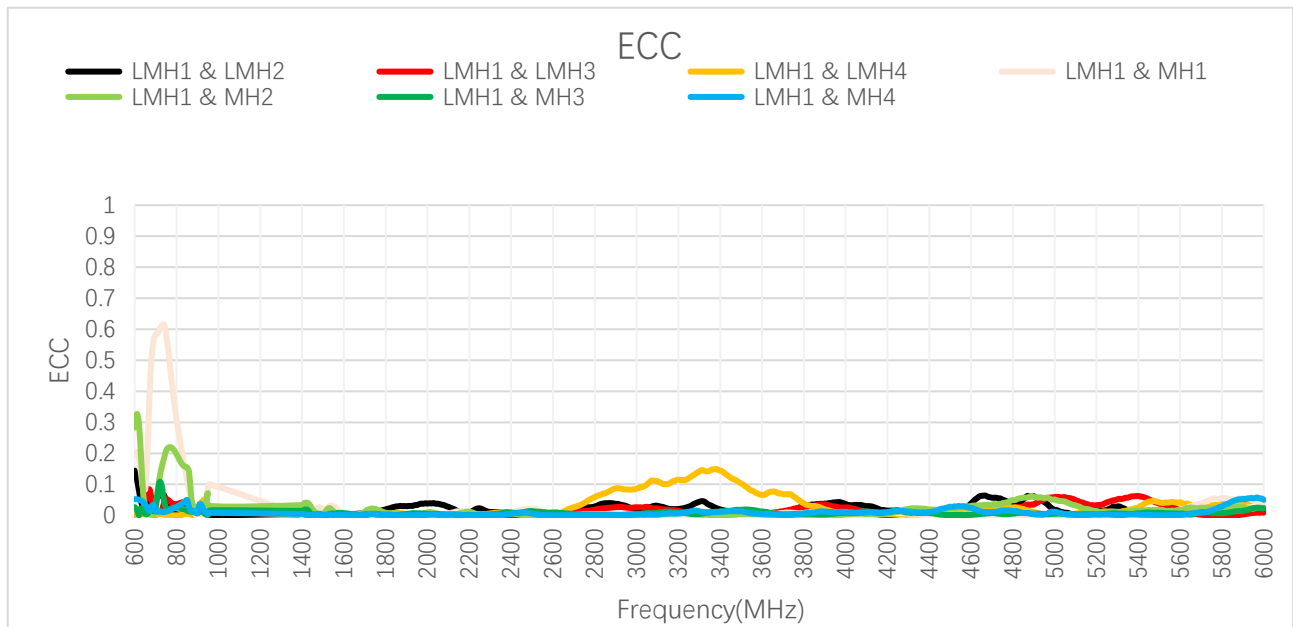
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	2.6	1.7	1.2	2.6
	MP	-	-	-	-	-	-	5.6	3.9	3.7	4.6
MH2	FS	-	-	-	-	-	-	-0.7	2.7	3.0	2.6
	MP	-	-	-	-	-	-	2.6	4.3	4.4	3.8
MH3	FS	-	-	-	-	-	-	1.2	2.2	2.4	2.0
	MP	-	-	-	-	-	-	2.0	3.5	4.1	3.2
MH4	FS	-	-	-	-	-	-	3.3	2.5	1.5	1.8
	MP	-	-	-	-	-	-	5.5	5.2	5.1	4.1
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	1.7	3.0	3.0	2.2	1.7	3.6	5.5	4.5	2.8	2.4
	MP	5.1	4.6	4.4	5.2	5.1	6.1	6.0	5.4	6.7	3.5
MH2	FS	3.0	4.0	2.8	3.0	3.0	5.8	4.2	1.7	3.7	2.4
	MP	3.5	3.4	2.3	4.7	4.9	5.6	5.8	5.9	4.7	4.4
MH3	FS	2.3	2.4	2.7	2.4	2.4	5.3	5.2	4.4	4.7	2.1
	MP	3.3	2.6	3.1	5.2	5.9	4.0	5.8	4.8	4.3	3.0
MH4	FS	1.5	1.7	2.8	3.0	2.1	4.7	5.4	5.4	3.6	2.1
	MP	4.0	4.4	5.4	5.9	3.8	4.5	6.2	4.4	4.3	1.8

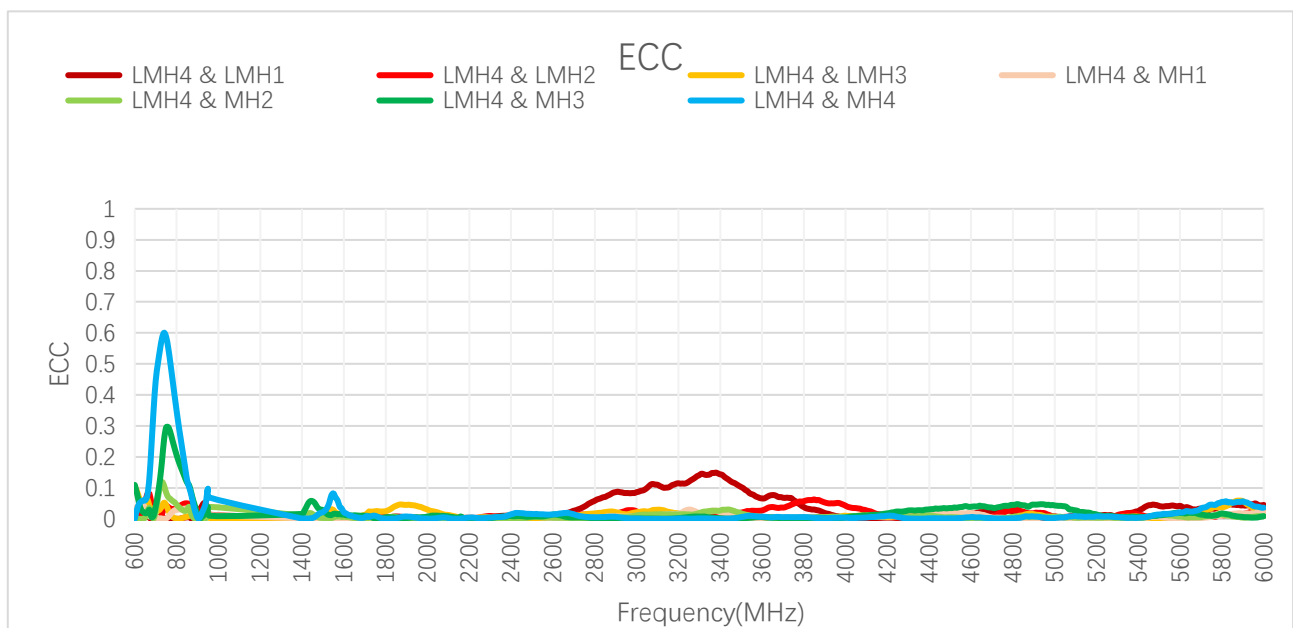
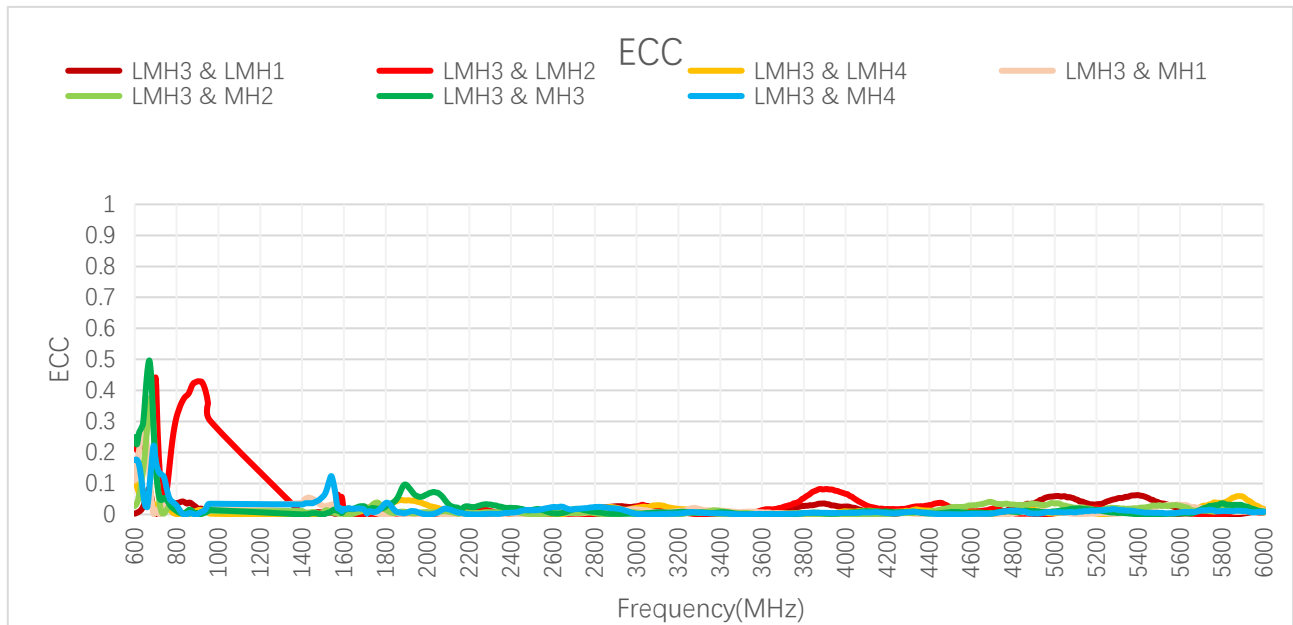
Peak Gain (dBi)

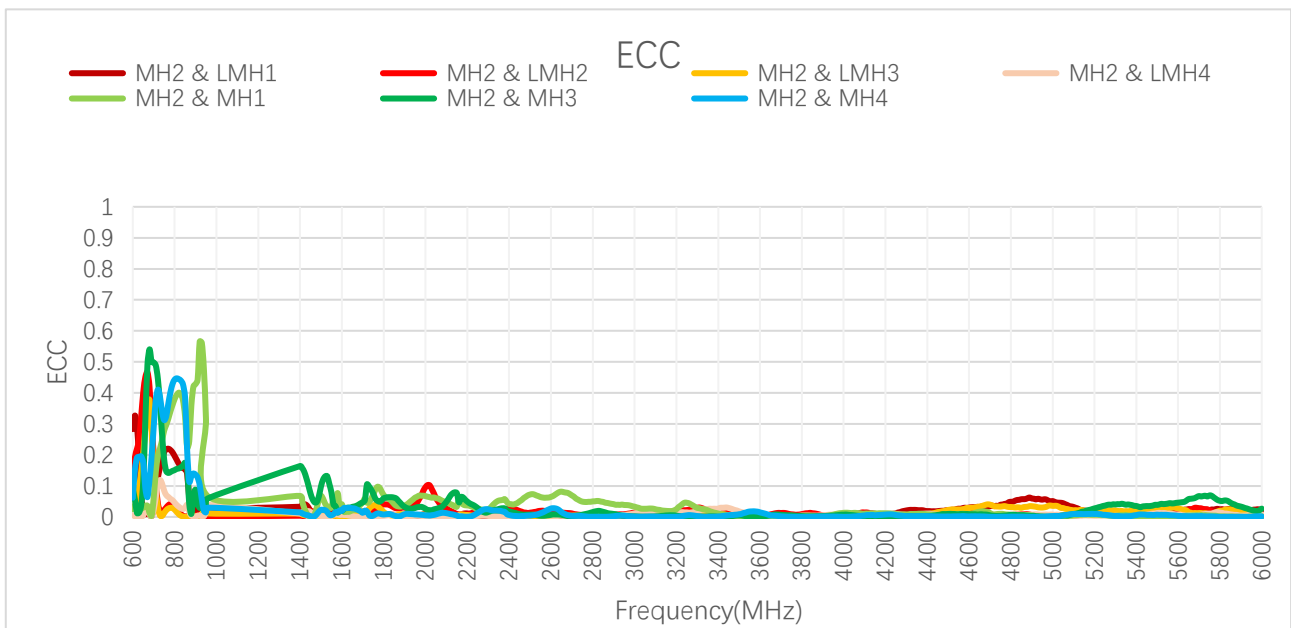
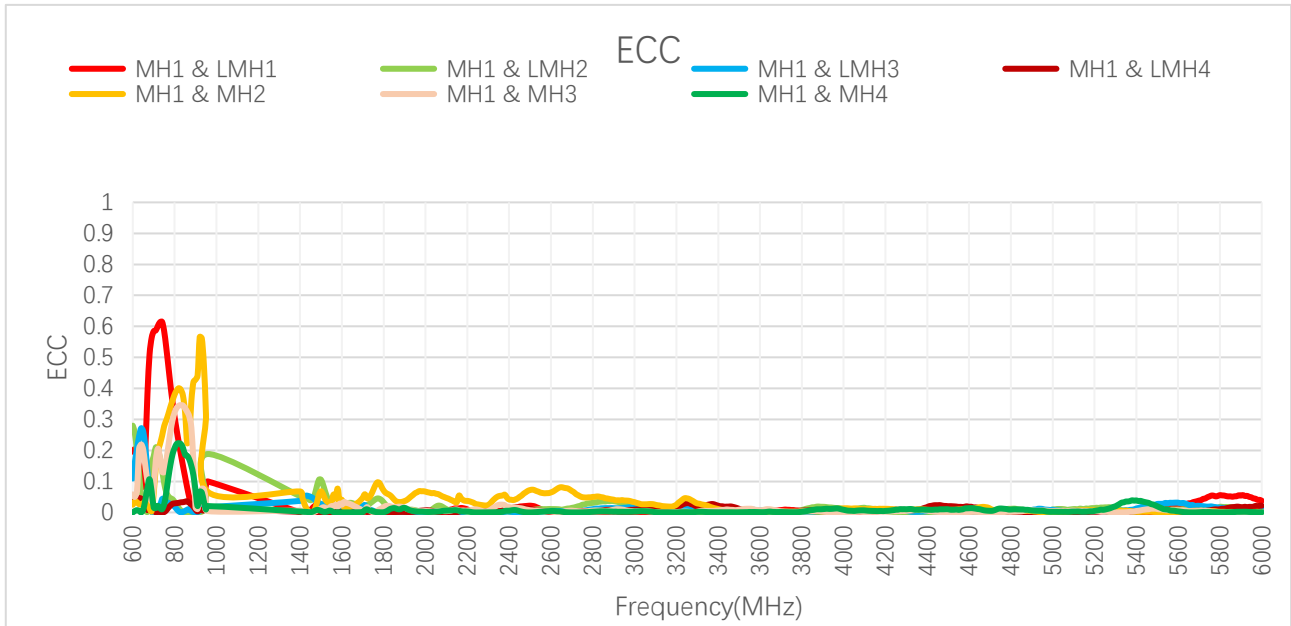
Frequency (MHz)		1176	1227	1561	1575	1602
GNSS	FS	2.8	-	3.9	4.2	2.7
	MP	3.9	-	6.3	5.4	3.1

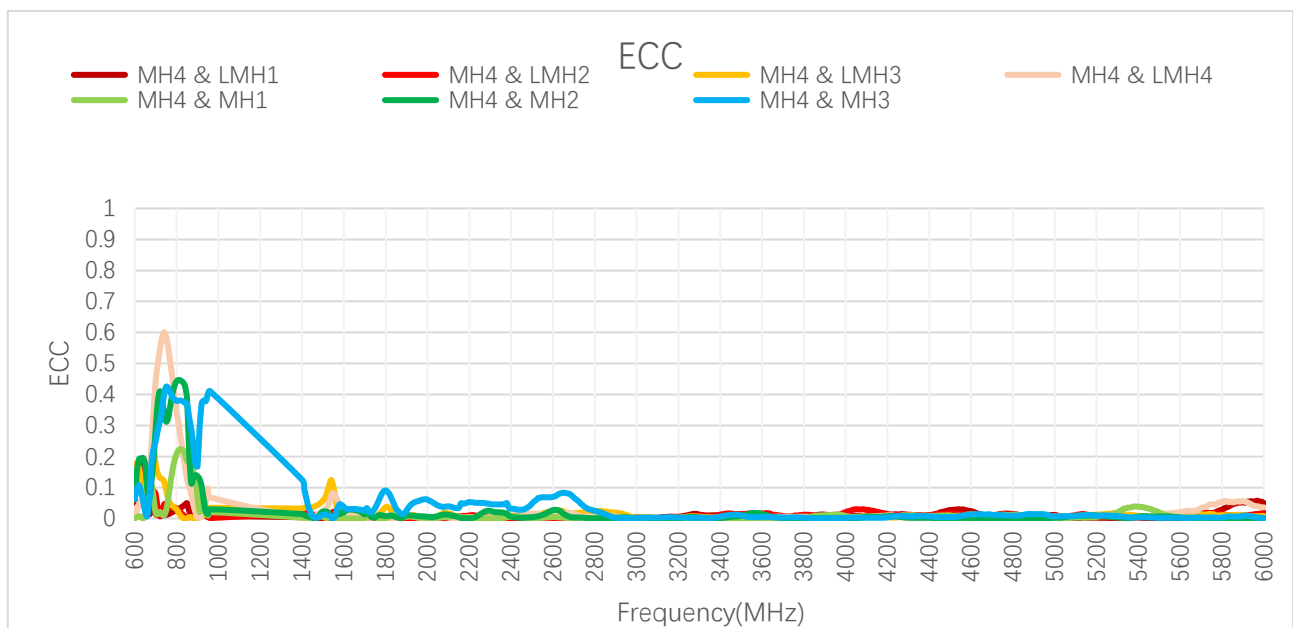
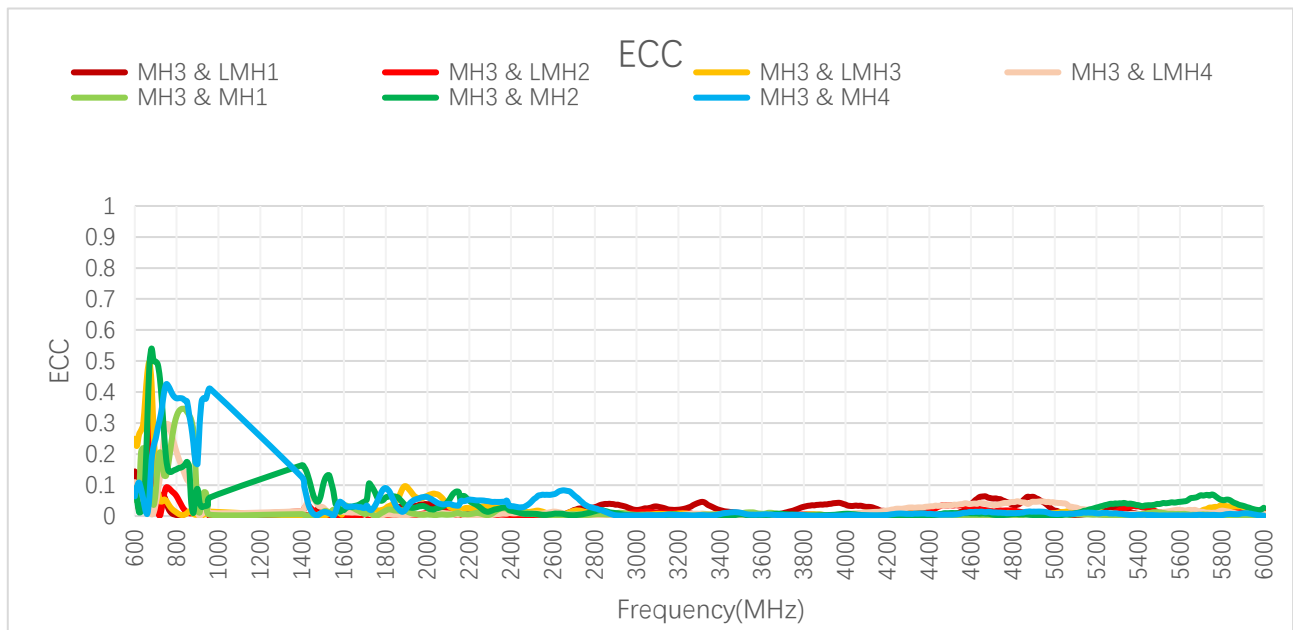
3.2.4. ECC

3.2.4.1. Test Status: In Free Space

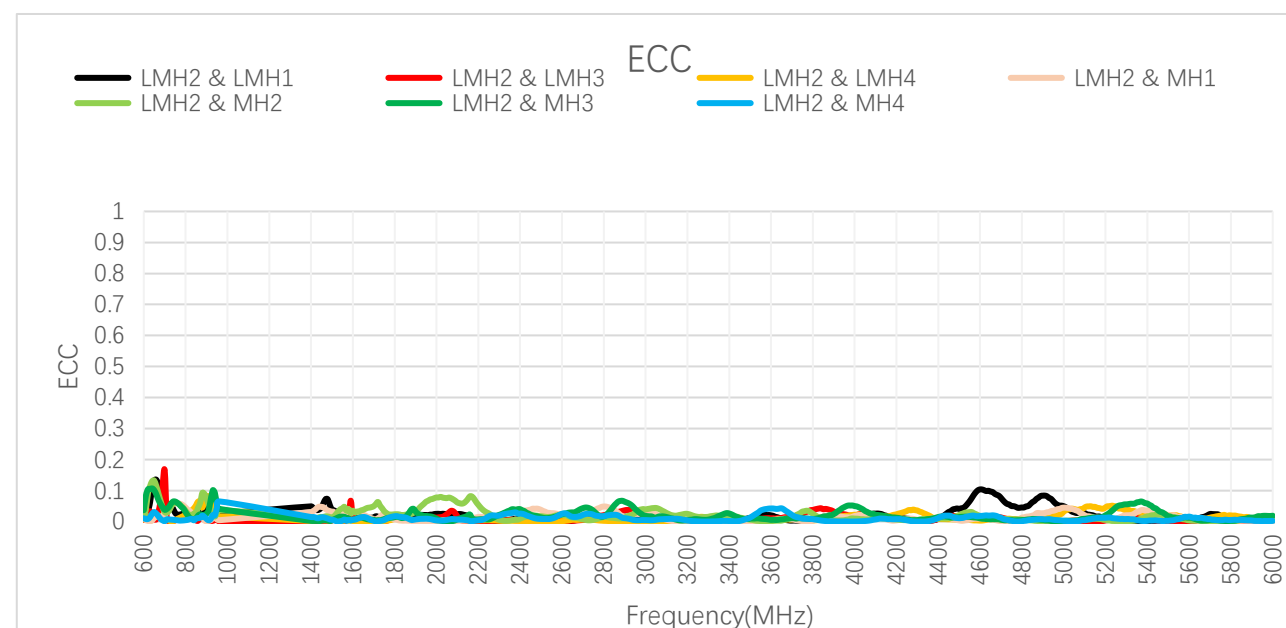
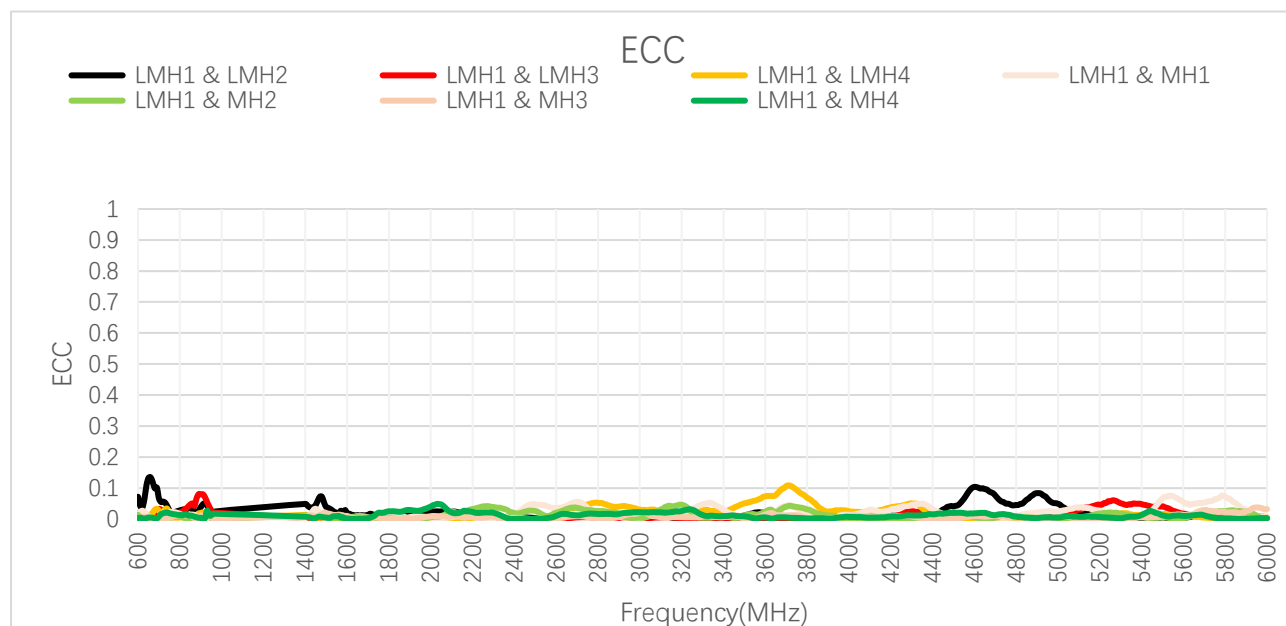


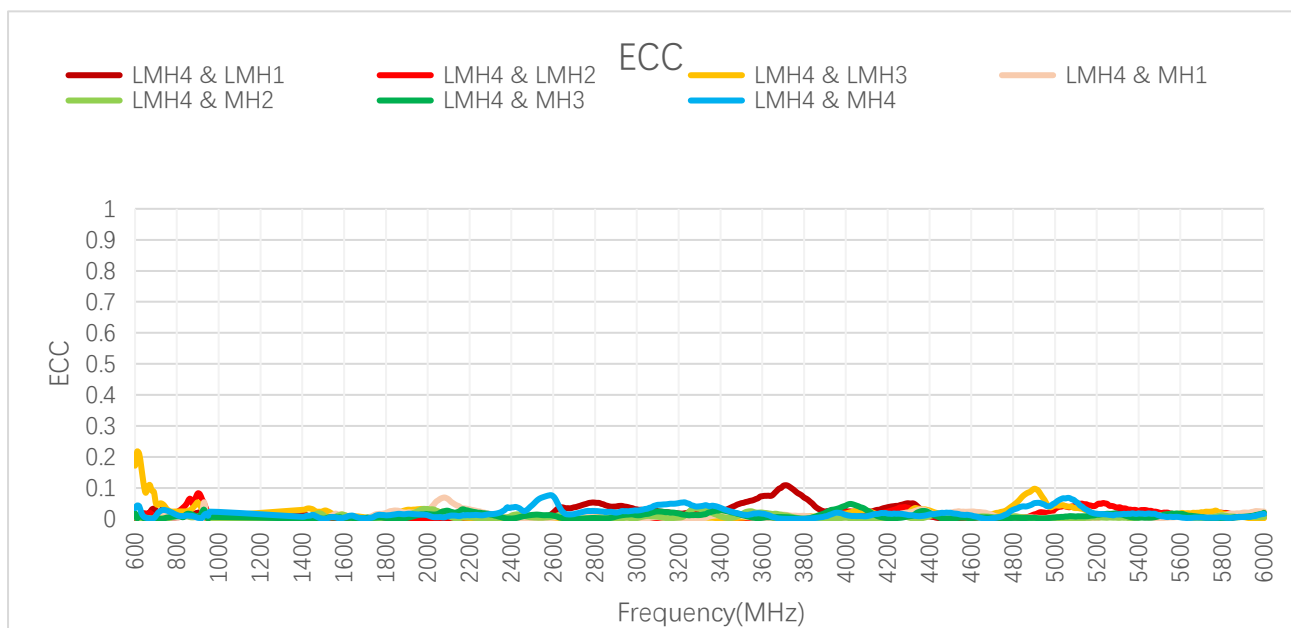
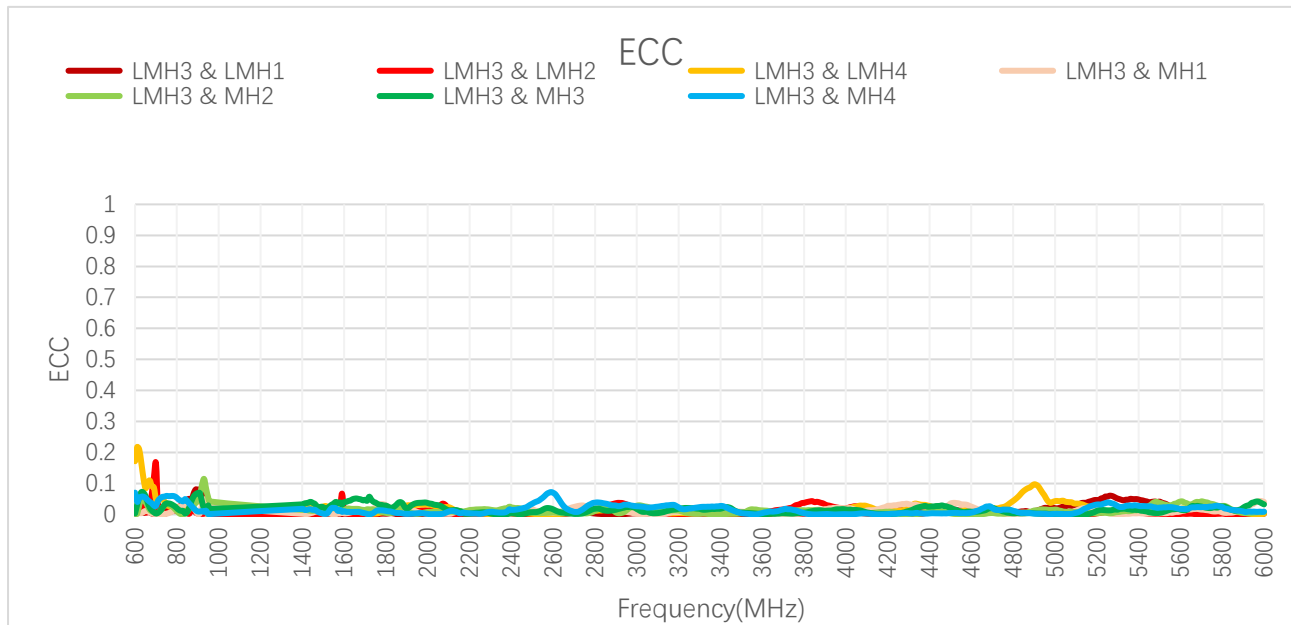


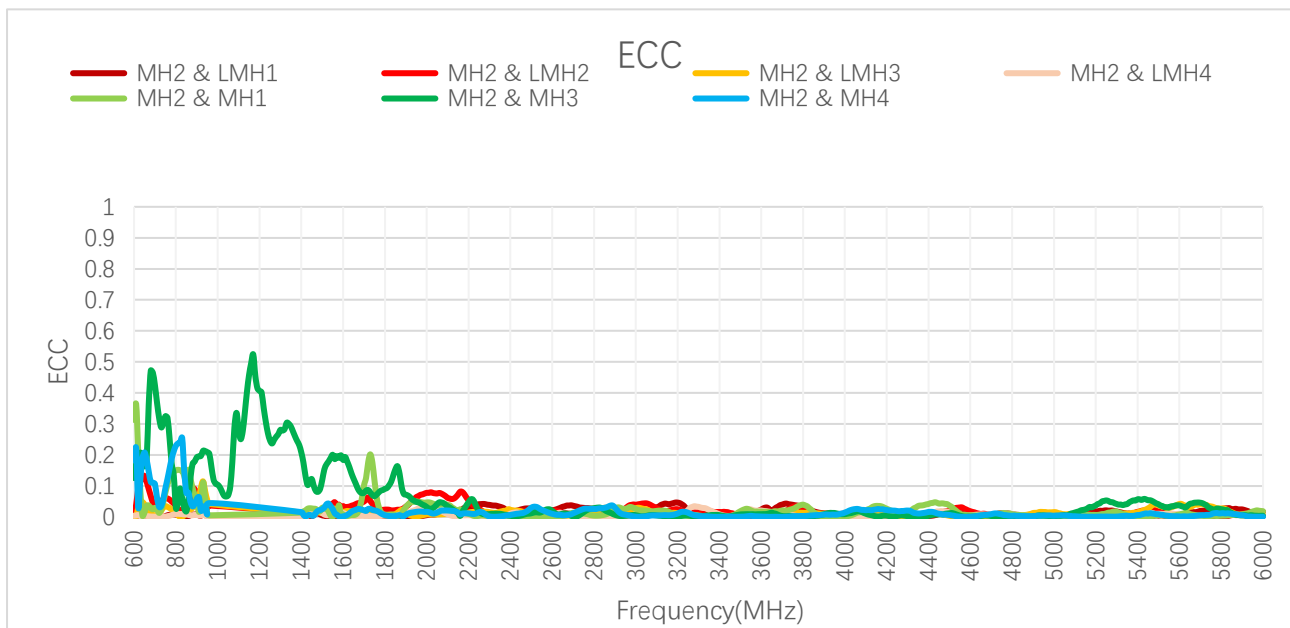
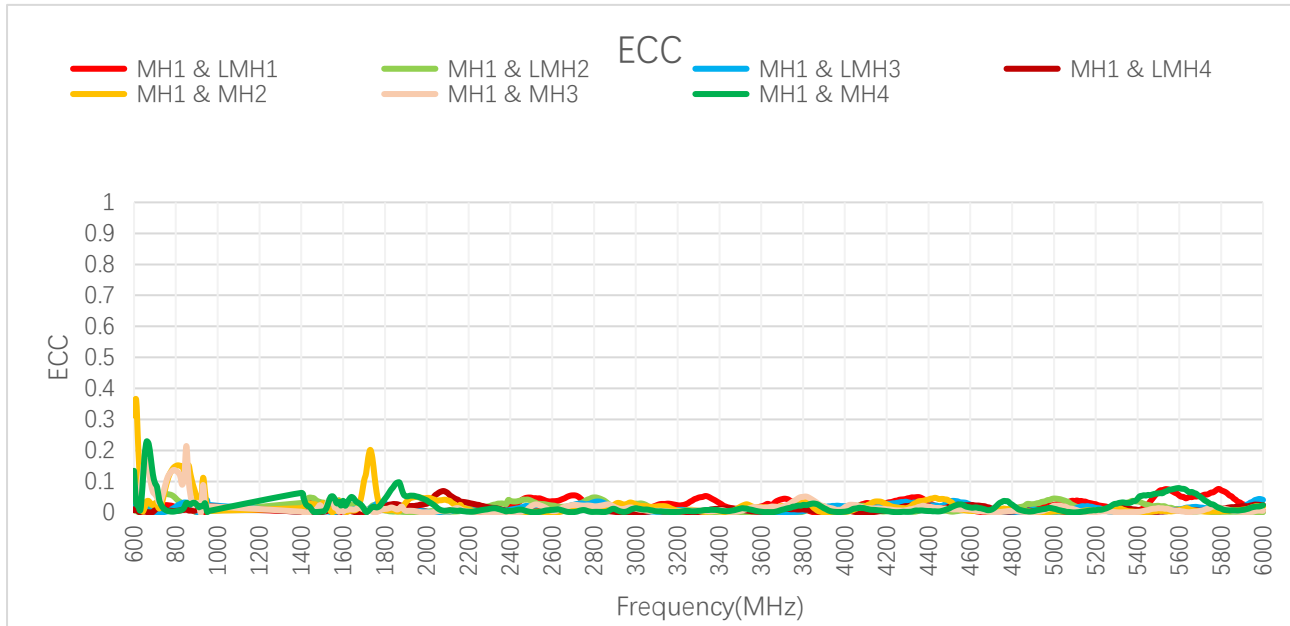


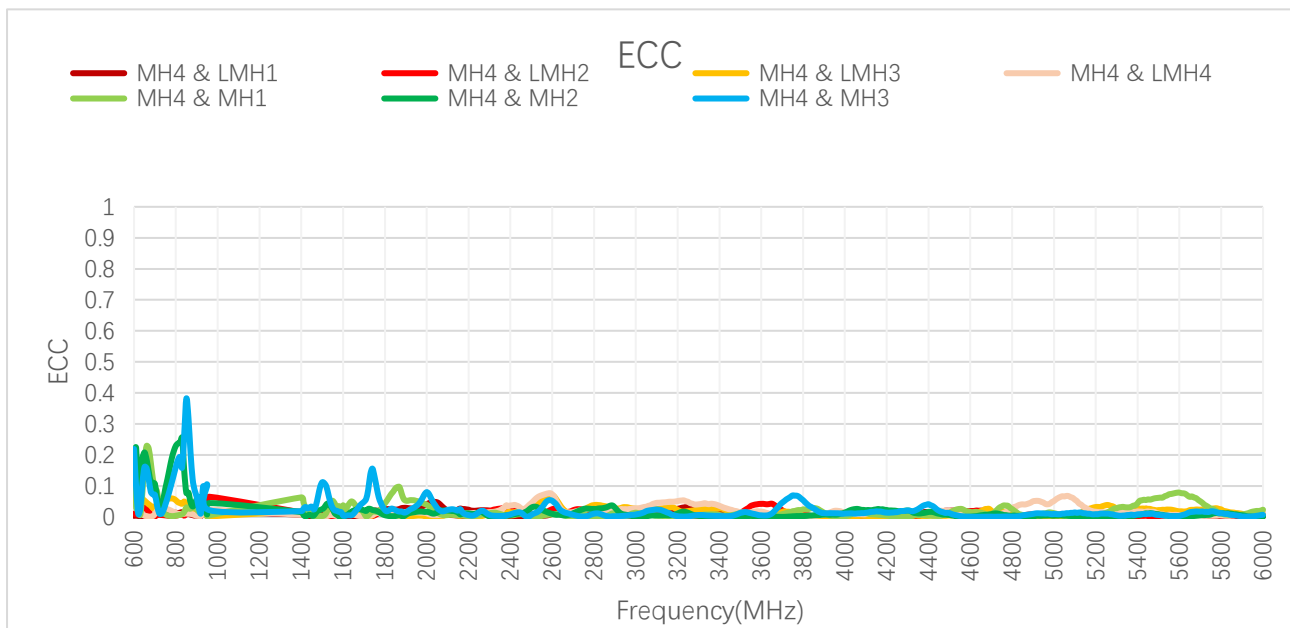
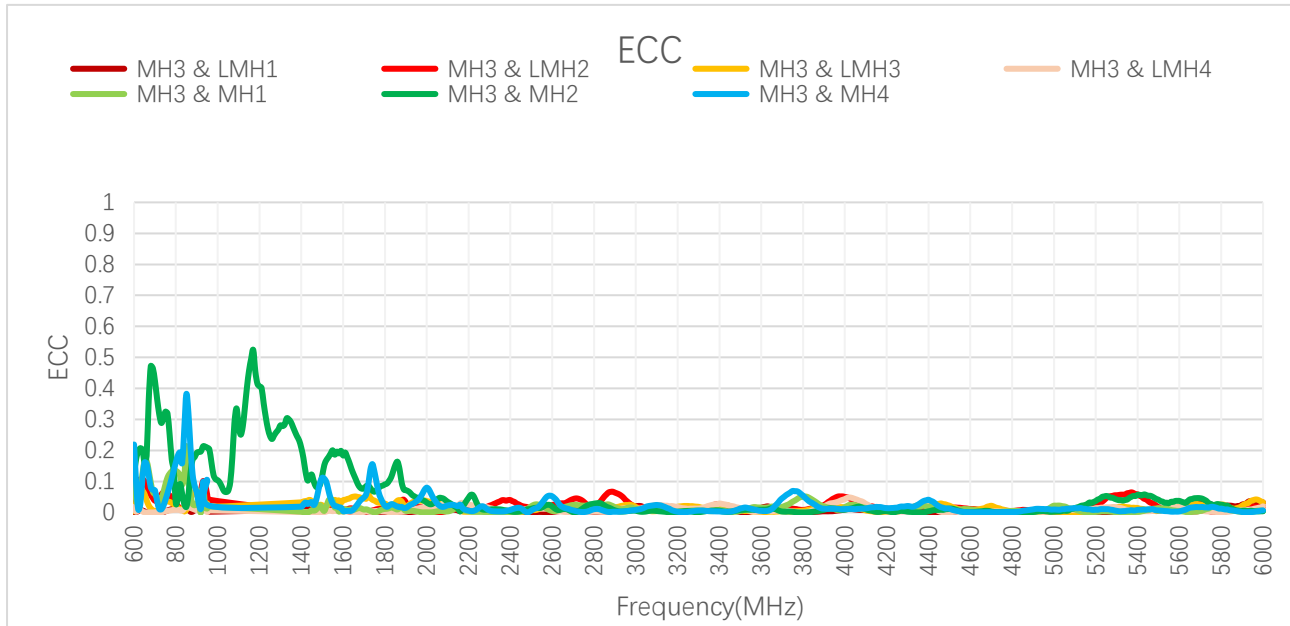


3.2.4.2. Test Status: On 500 × 500 mm Metal Plane





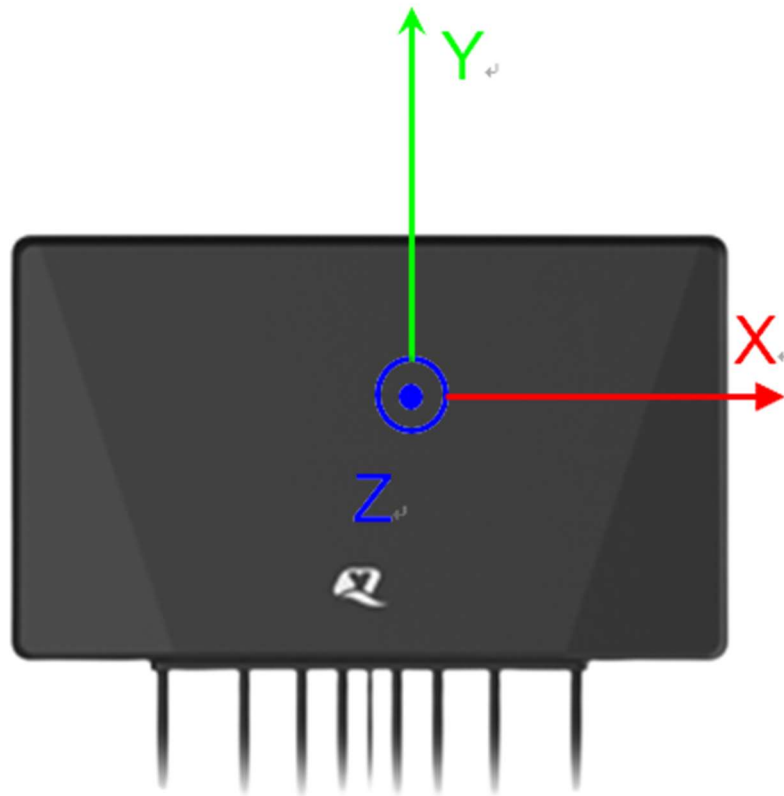




3.2.5. 3D & 2D Radiation Pattern

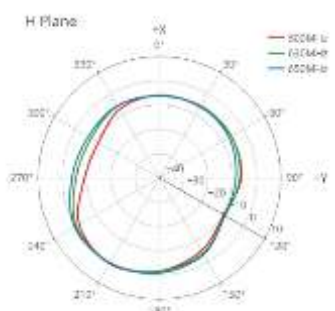
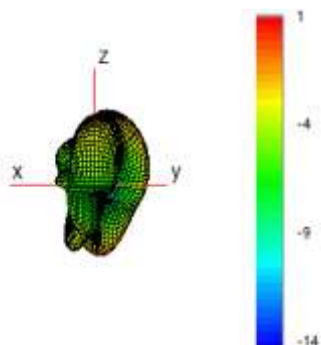
3.2.5.1. Test Condition: In Free Space

- Test Chamber: HF-G-1

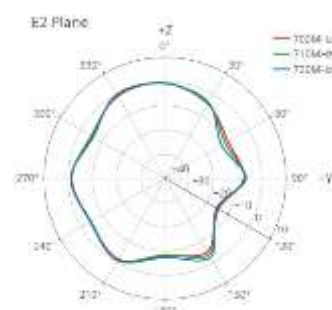
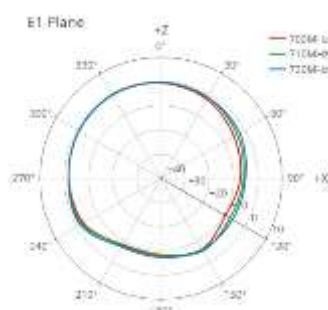
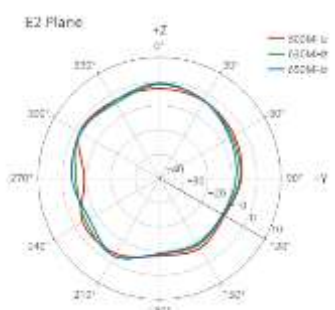
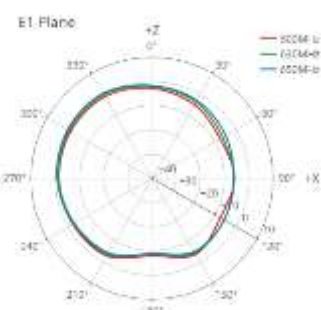
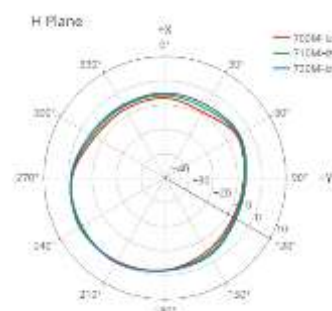
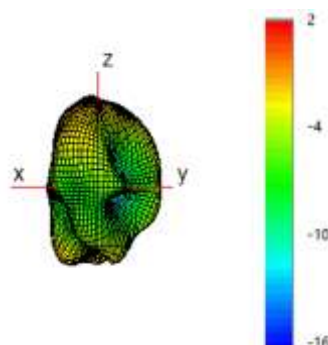


● **LMH1**

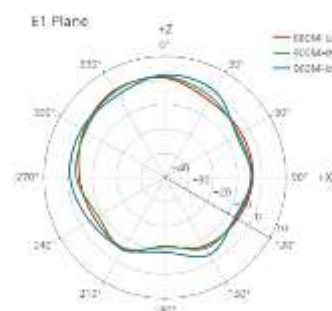
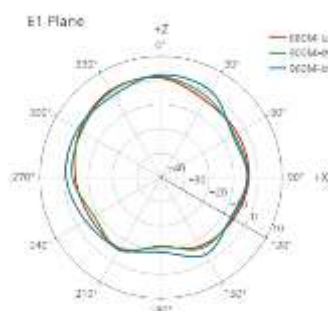
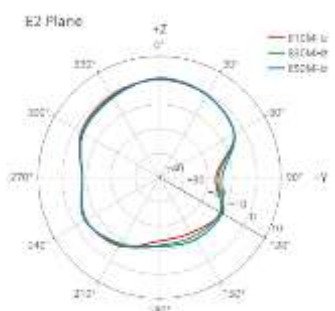
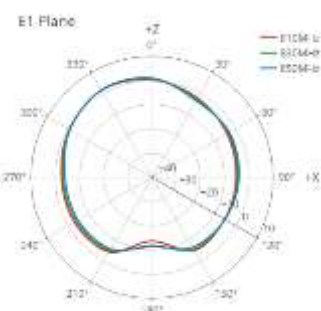
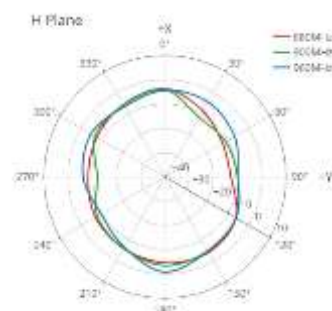
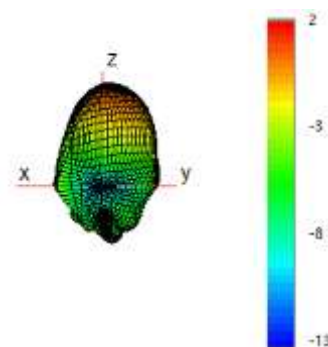
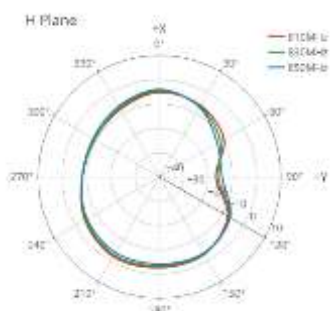
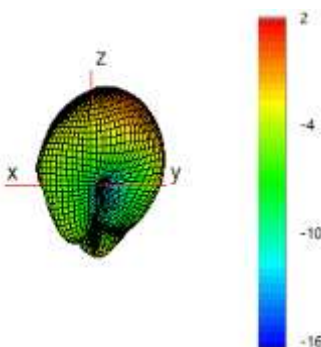
630 MHz



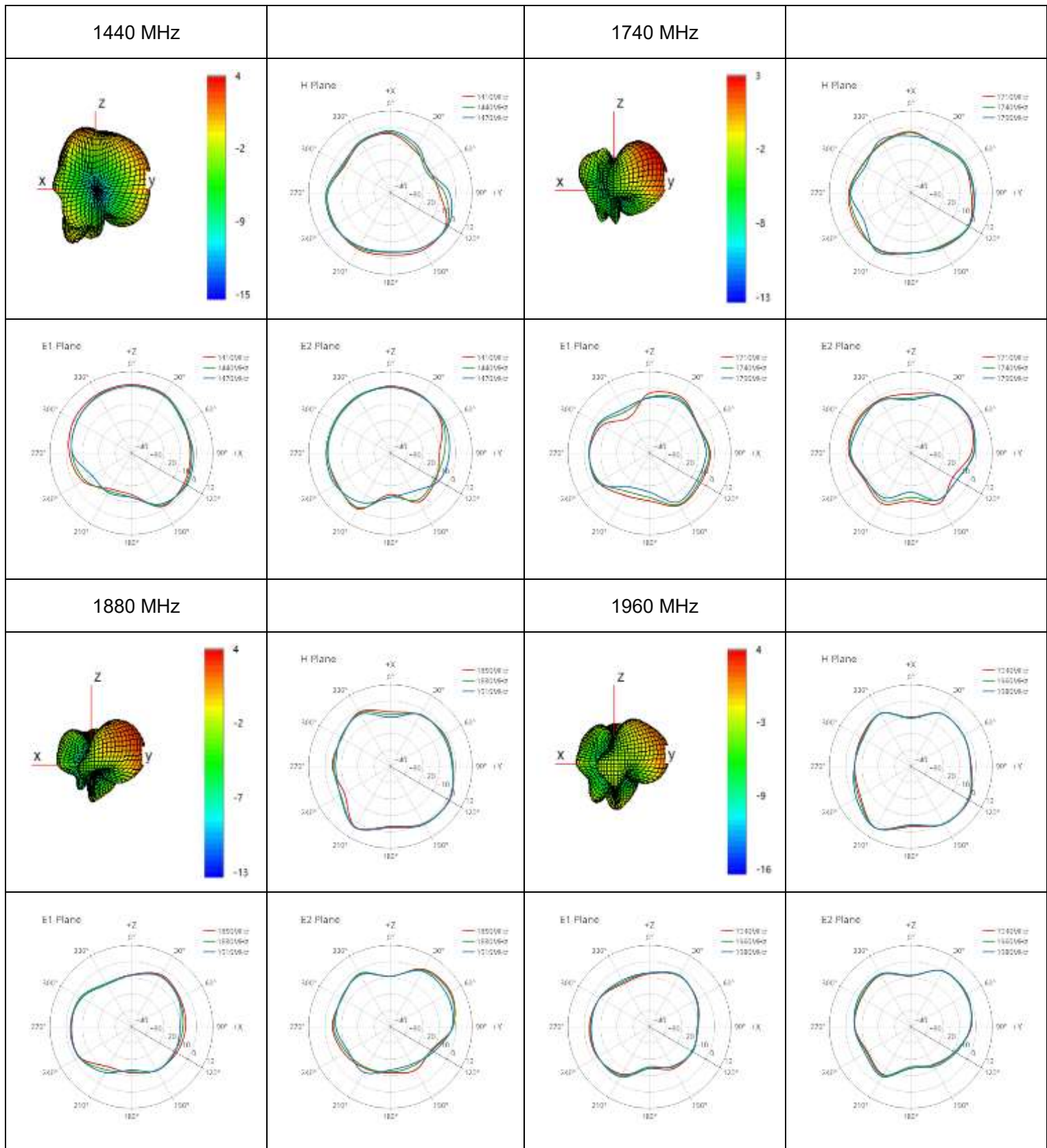
710 MHz



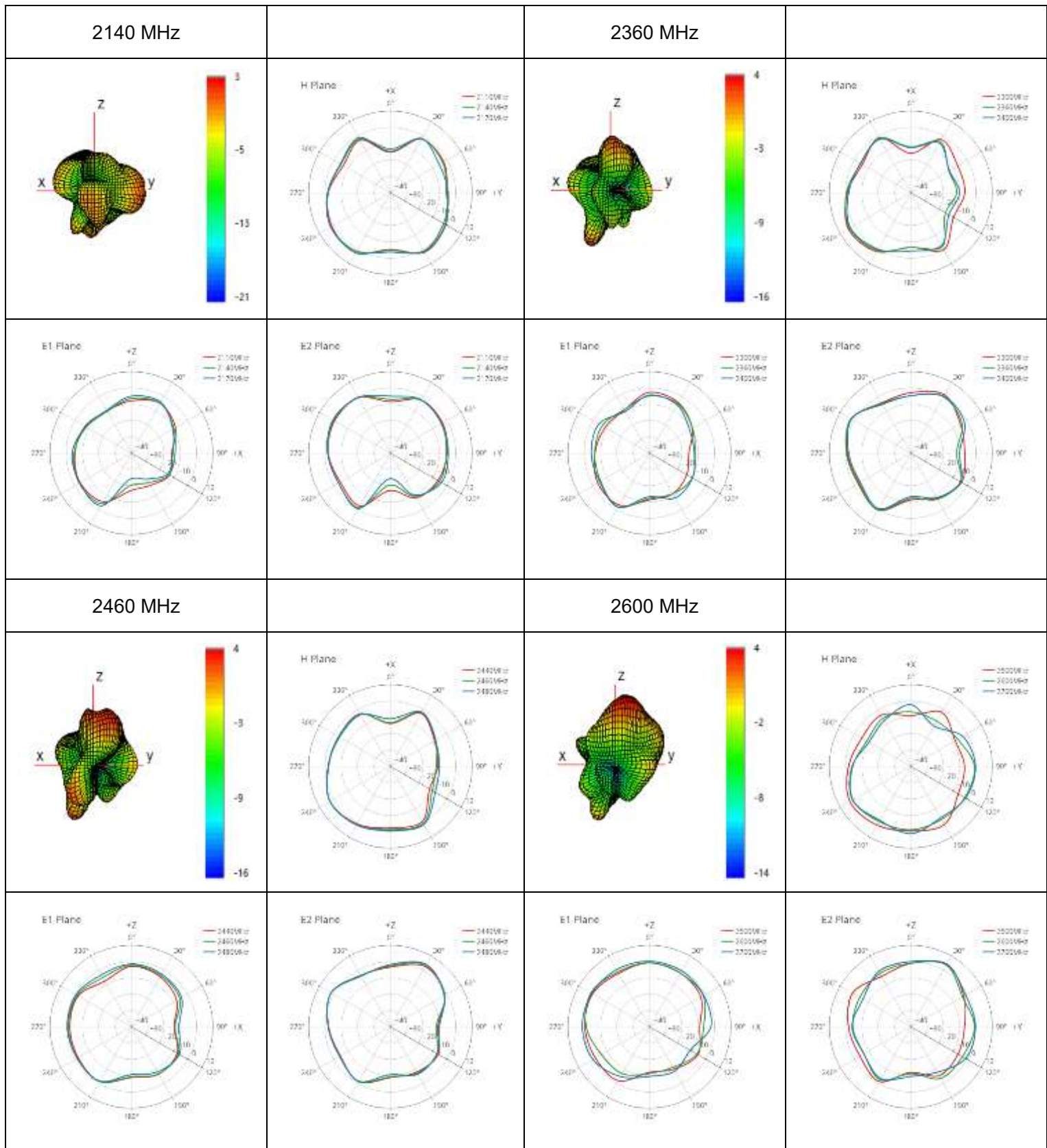
830 MHz



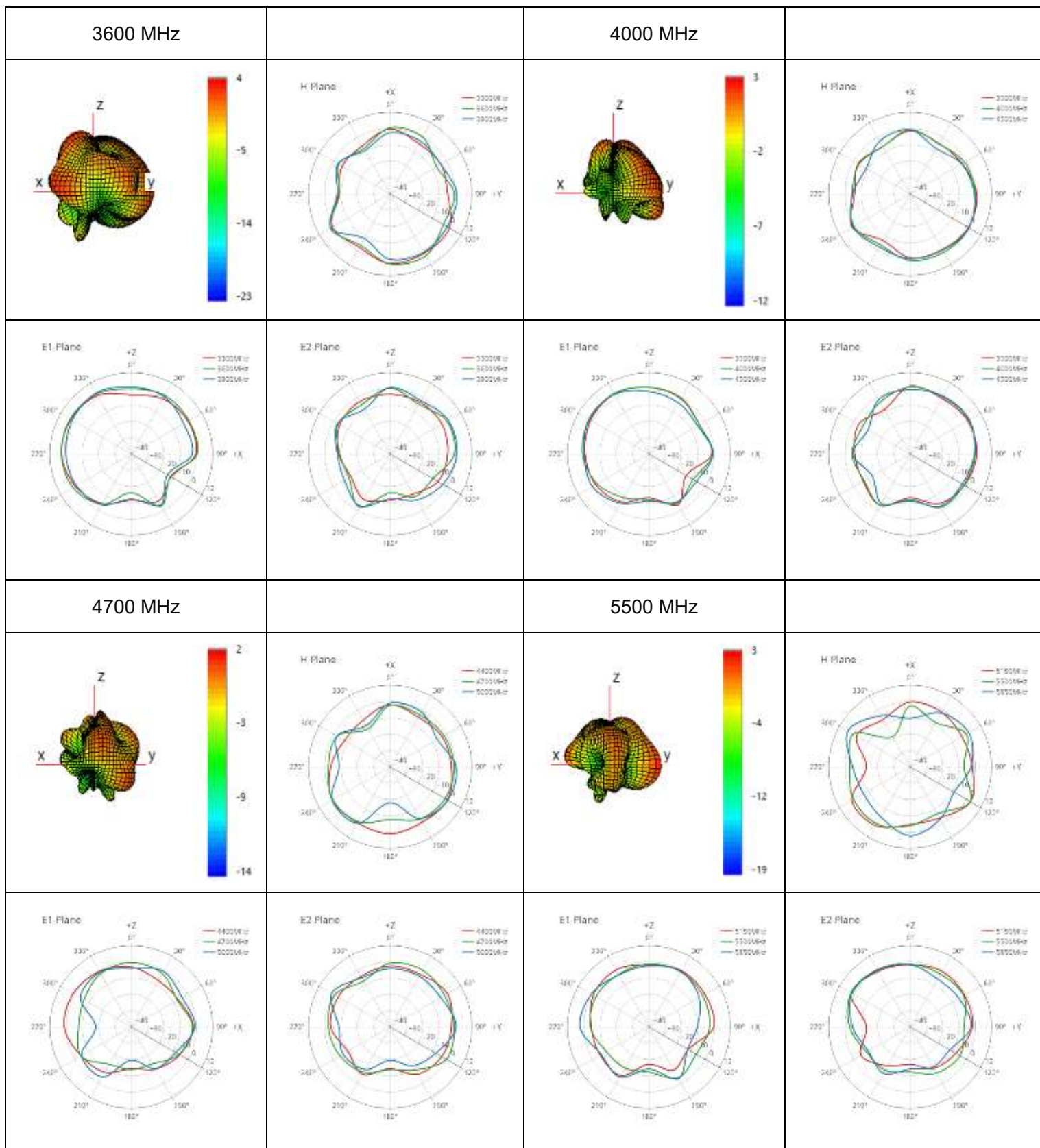
● **LMH1**



● **LMH1**

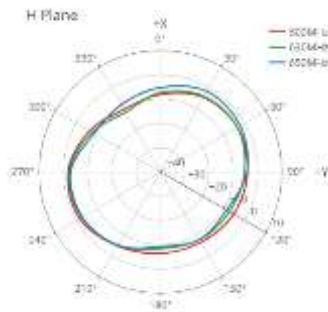
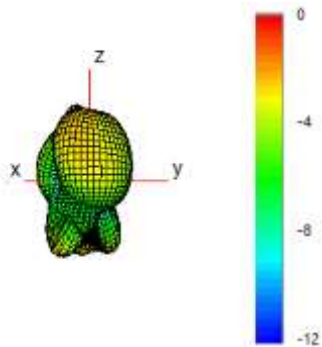


● **LMH1**

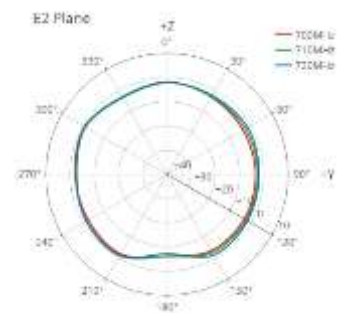
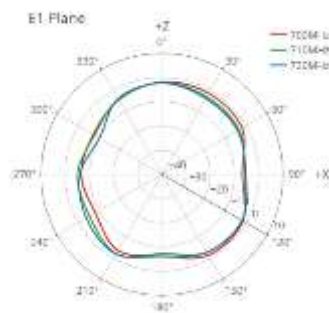
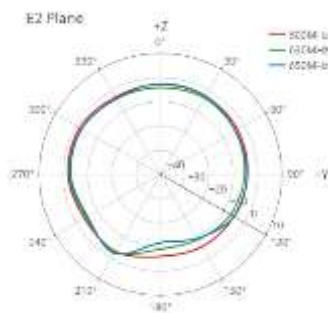
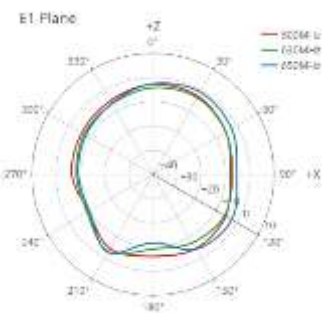
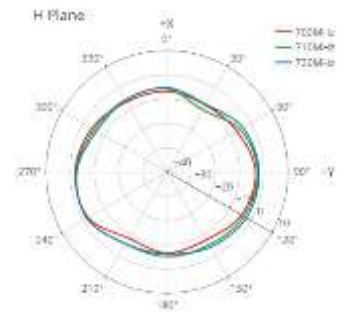
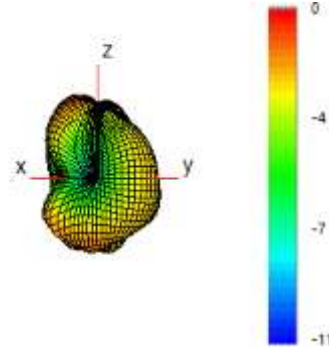


● **LMH2**

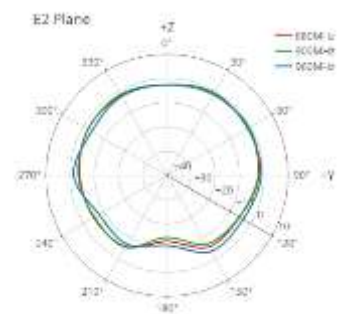
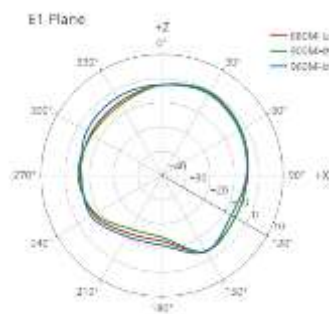
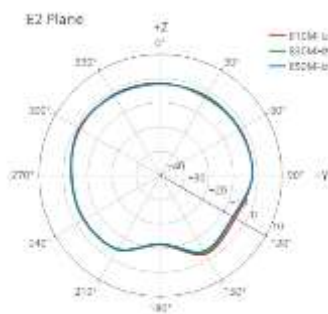
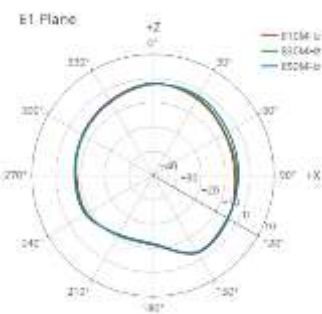
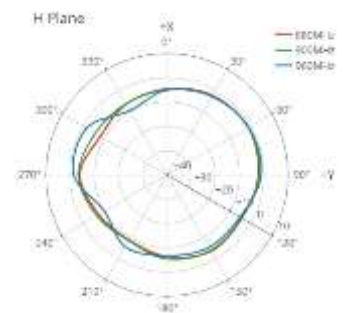
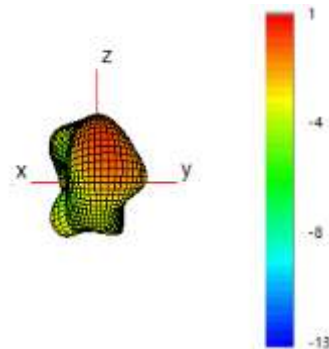
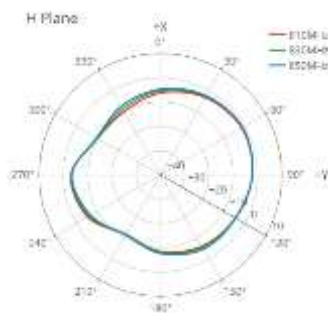
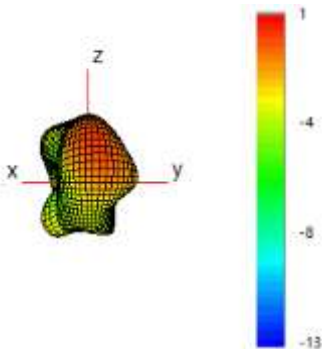
630 MHz



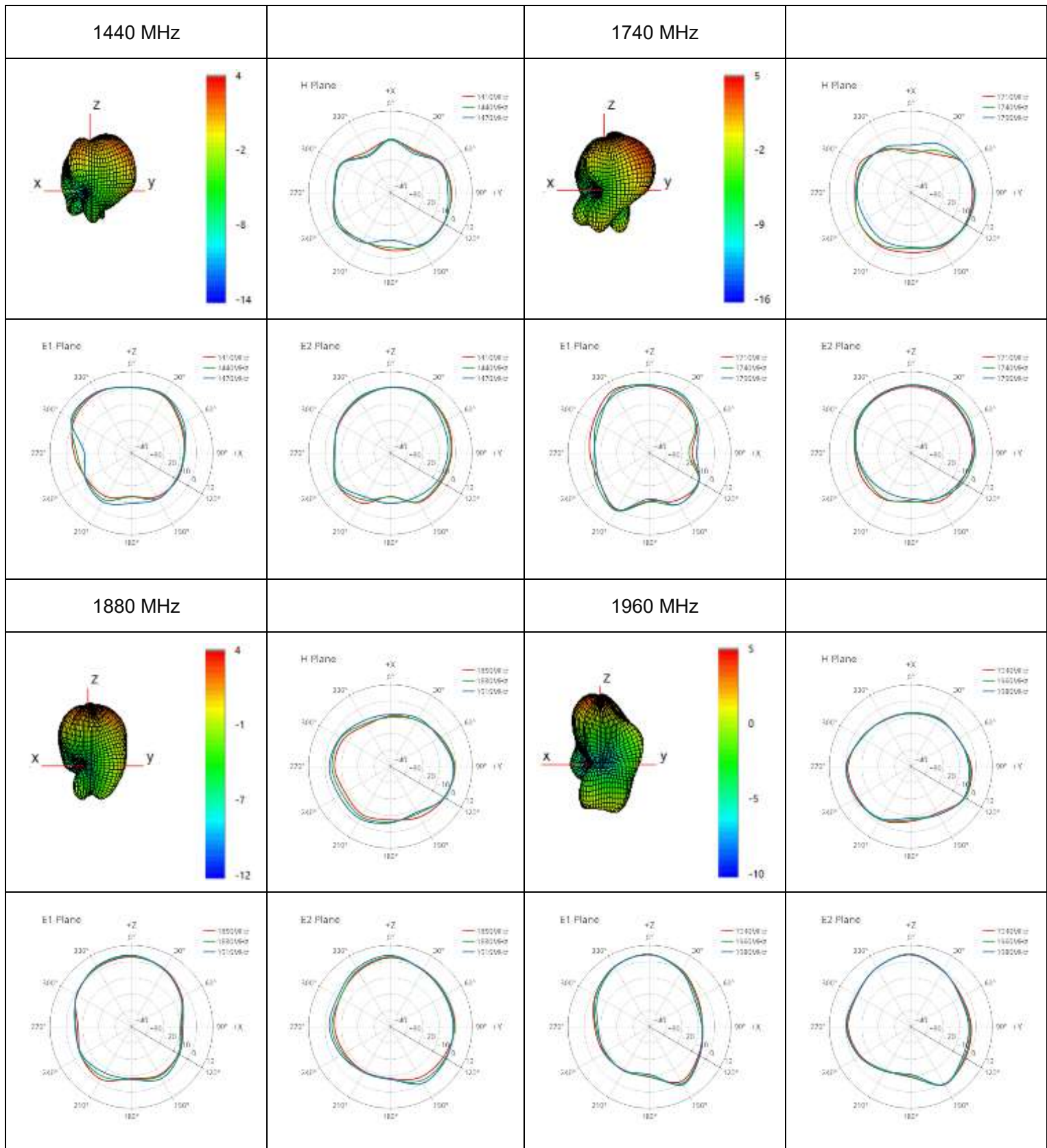
710 MHz



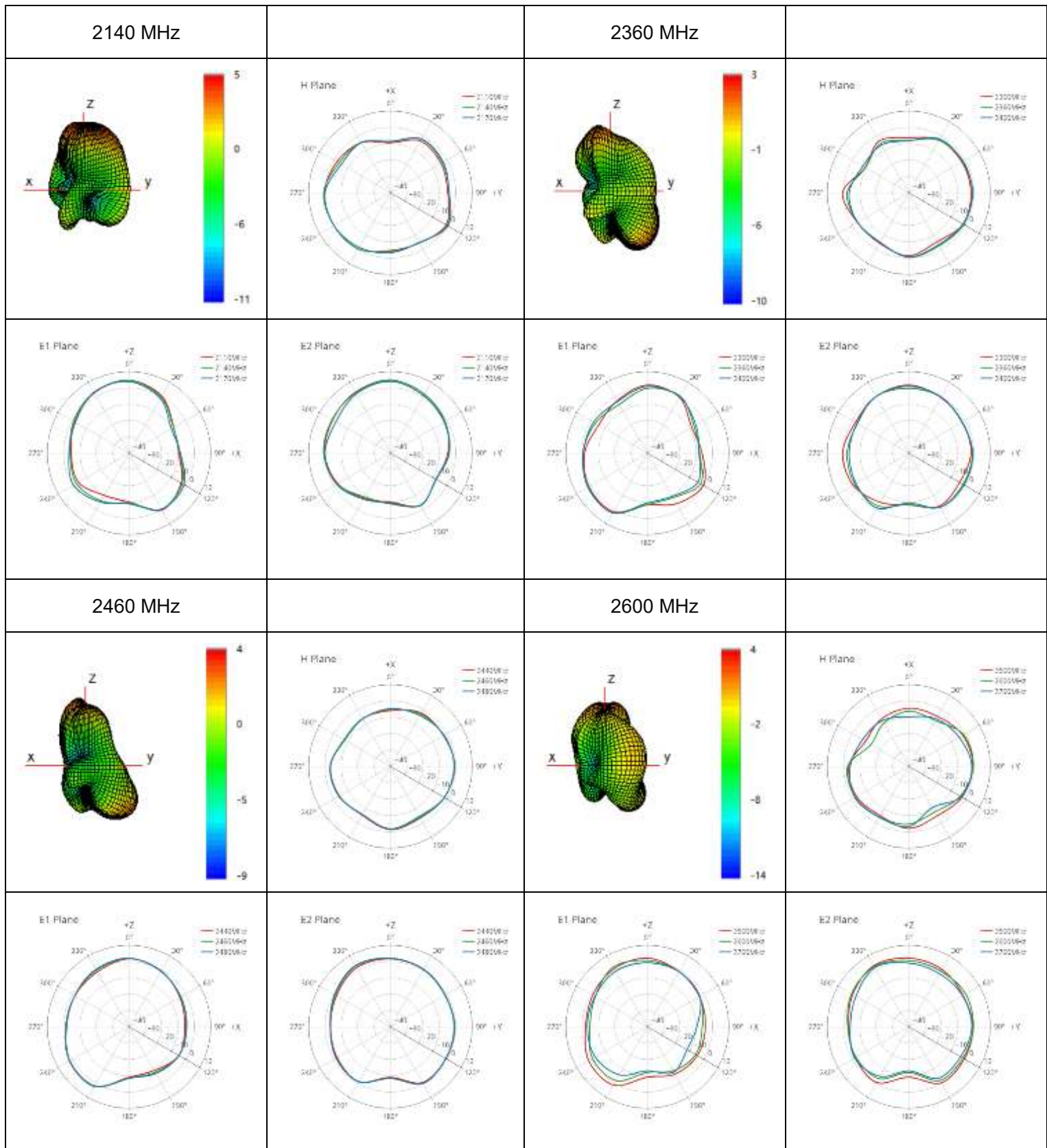
830 MHz



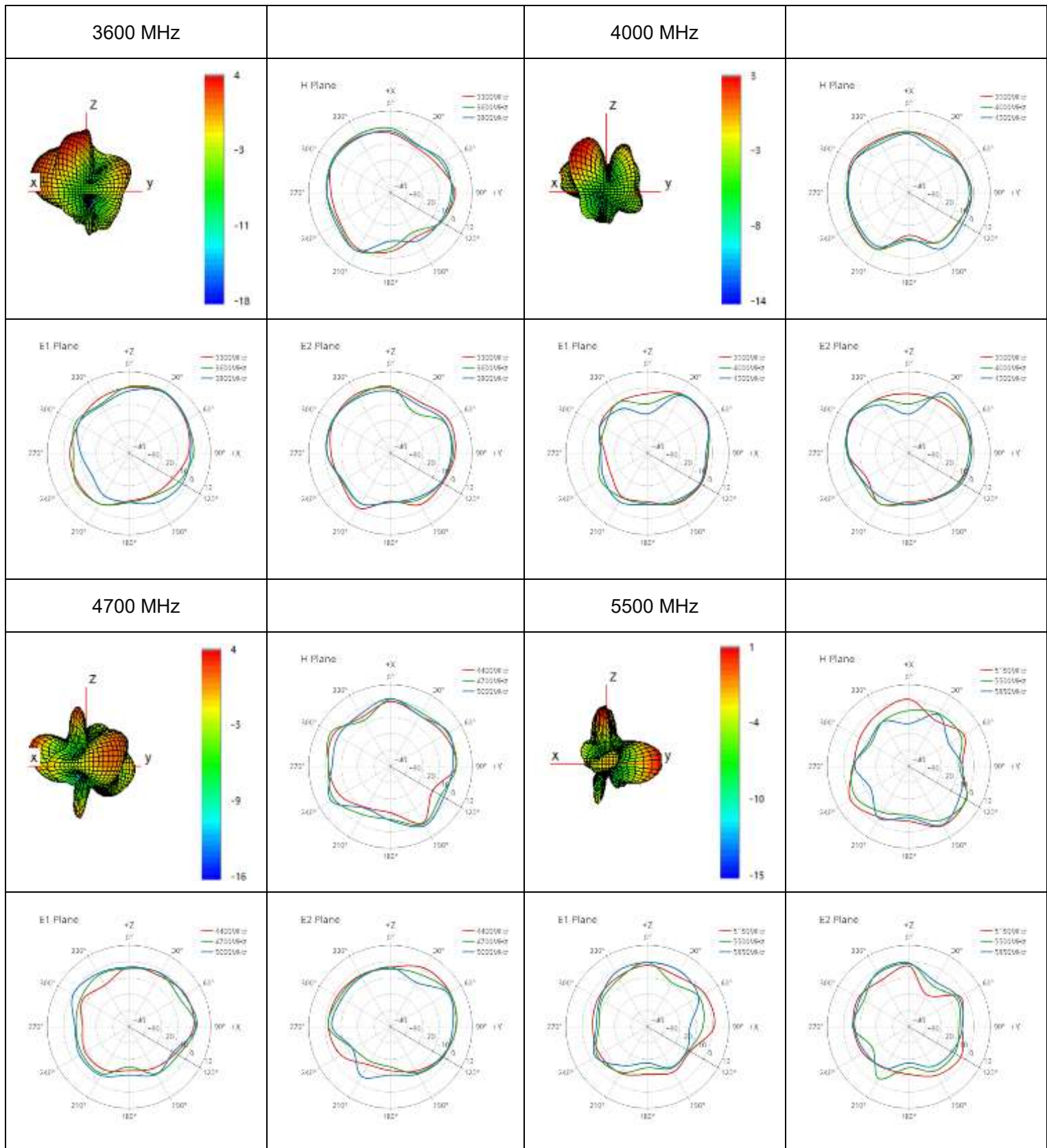
● **LMH2**



● **LMH2**

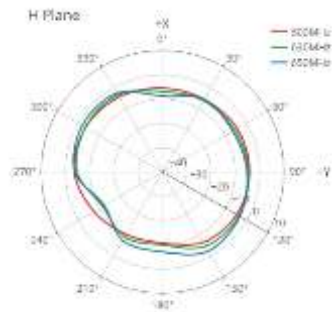
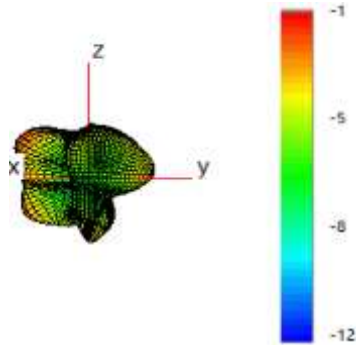


● **LMH2**

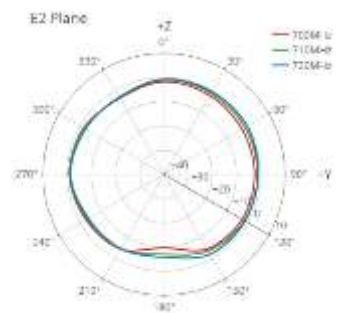
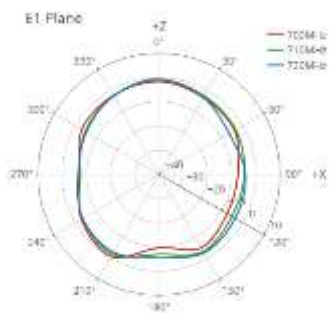
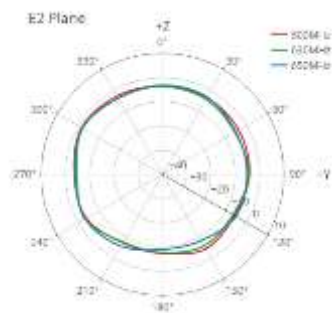
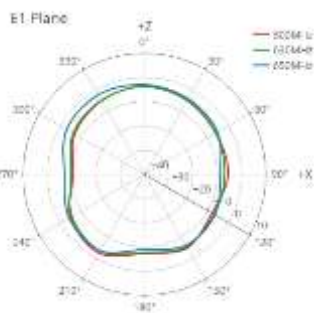
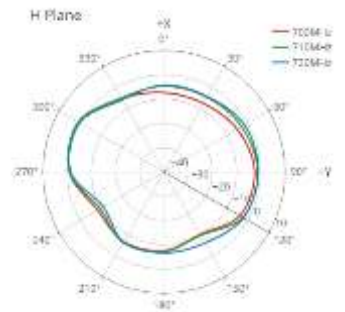
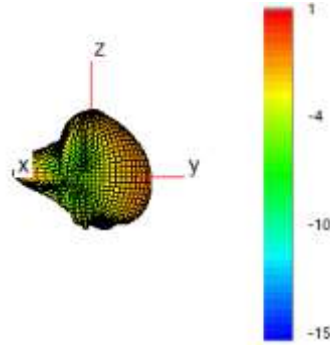


● **LMH3**

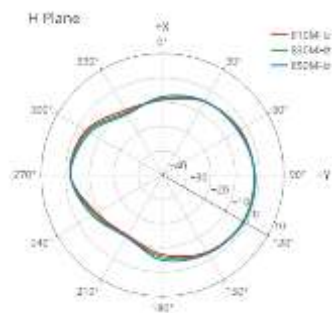
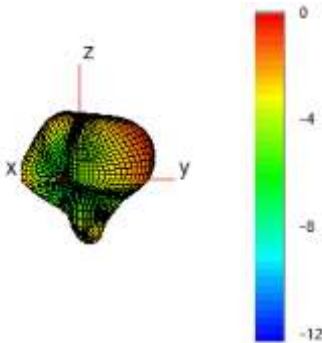
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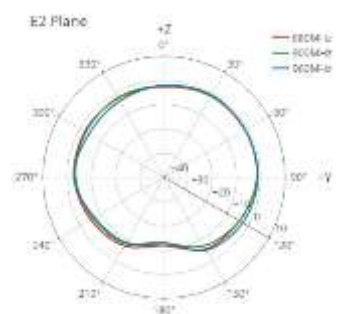
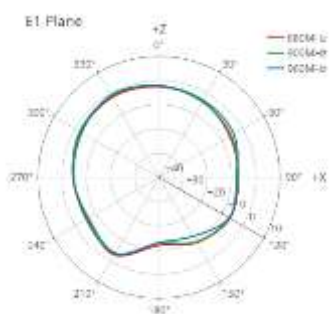
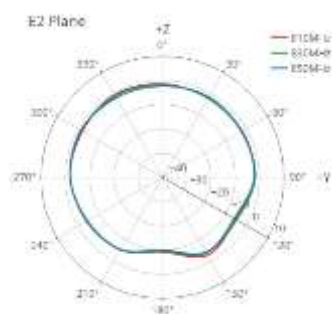
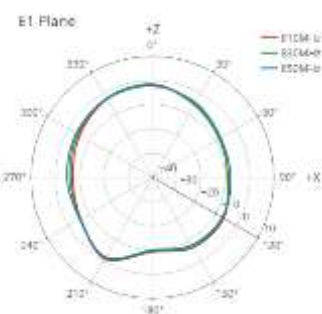
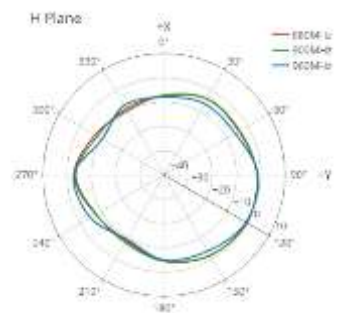
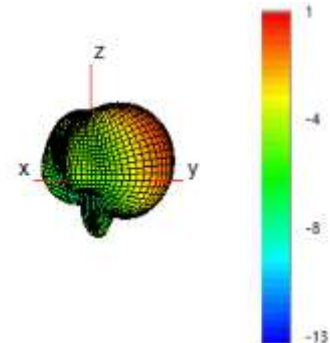
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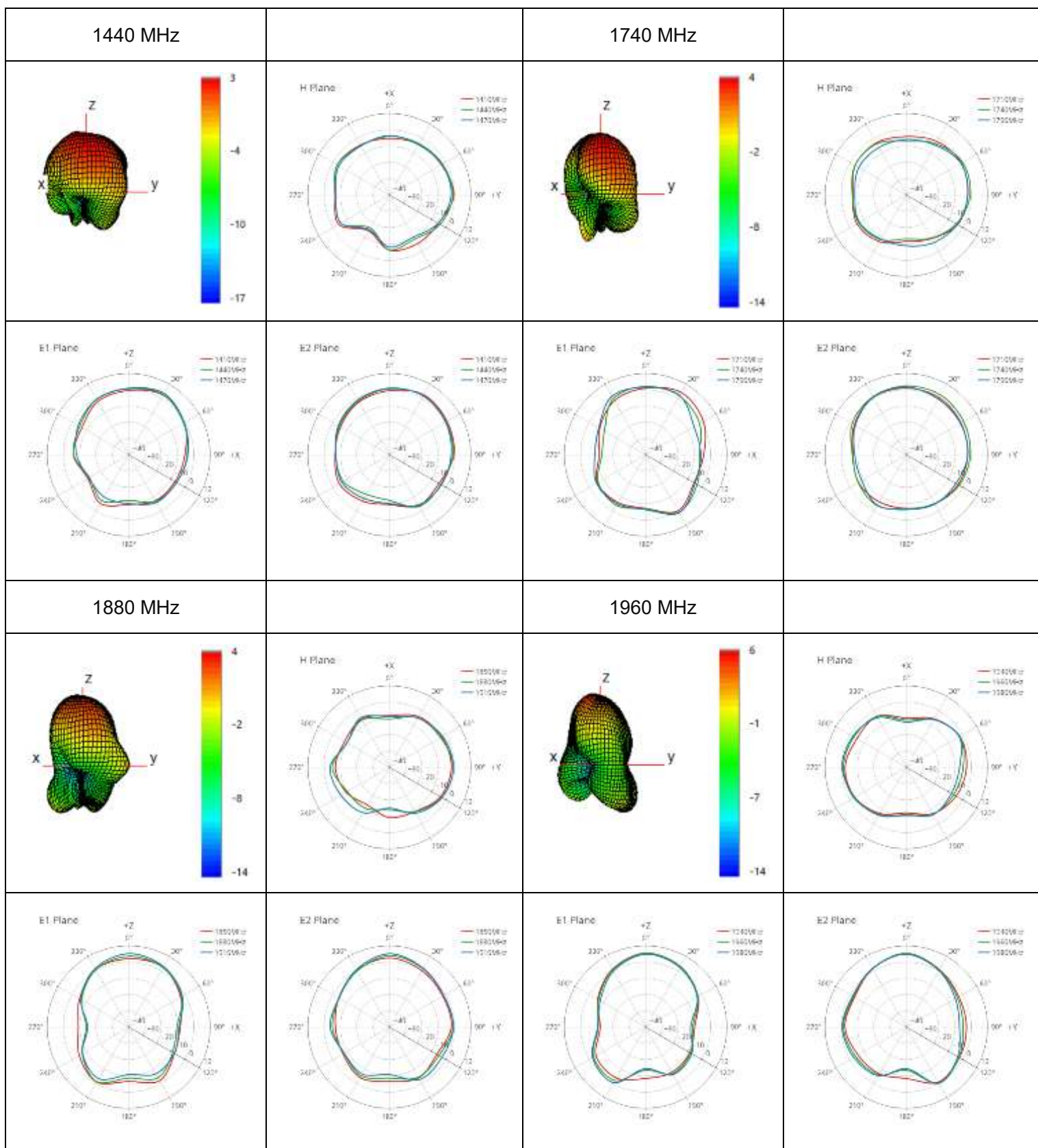
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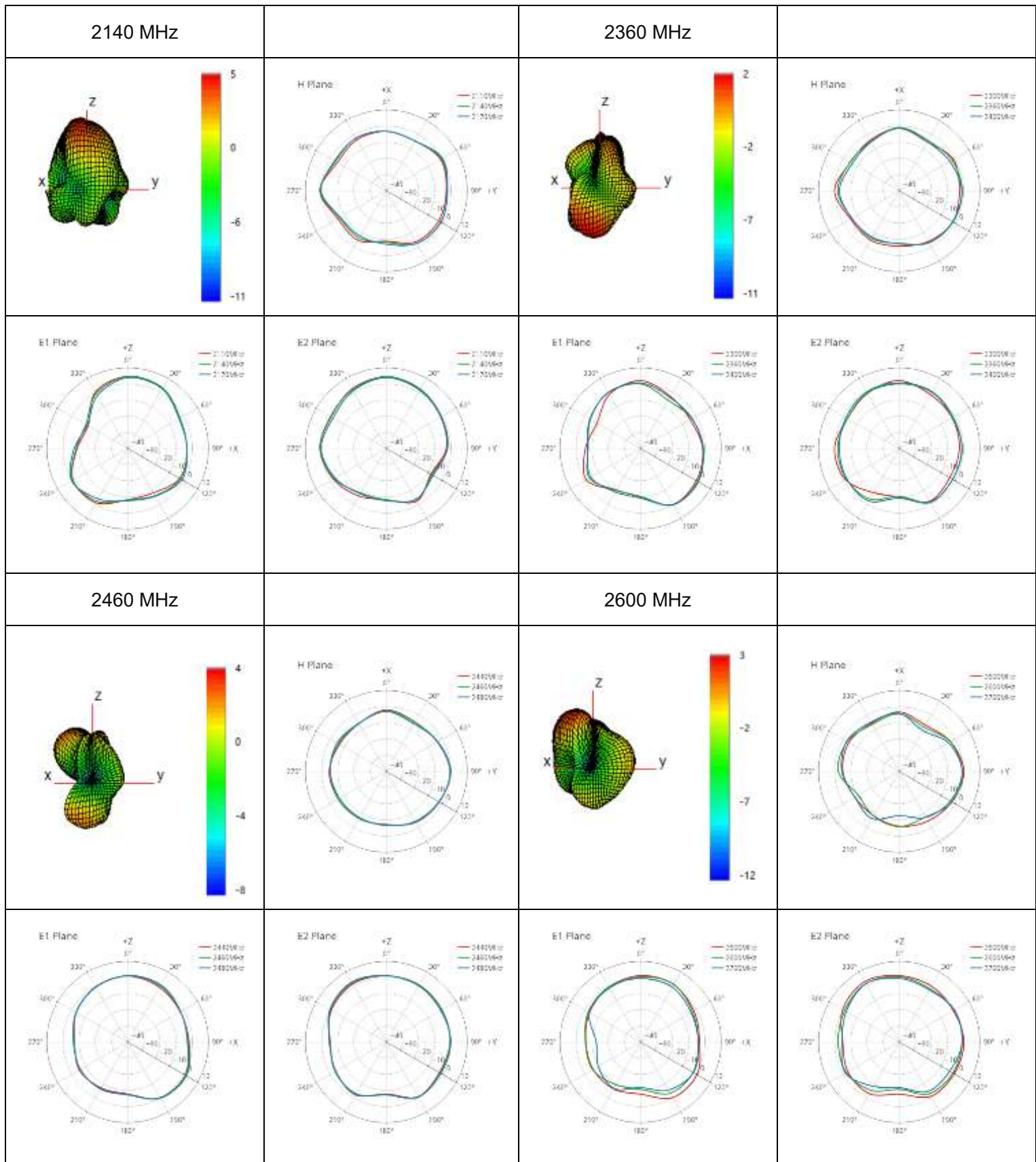
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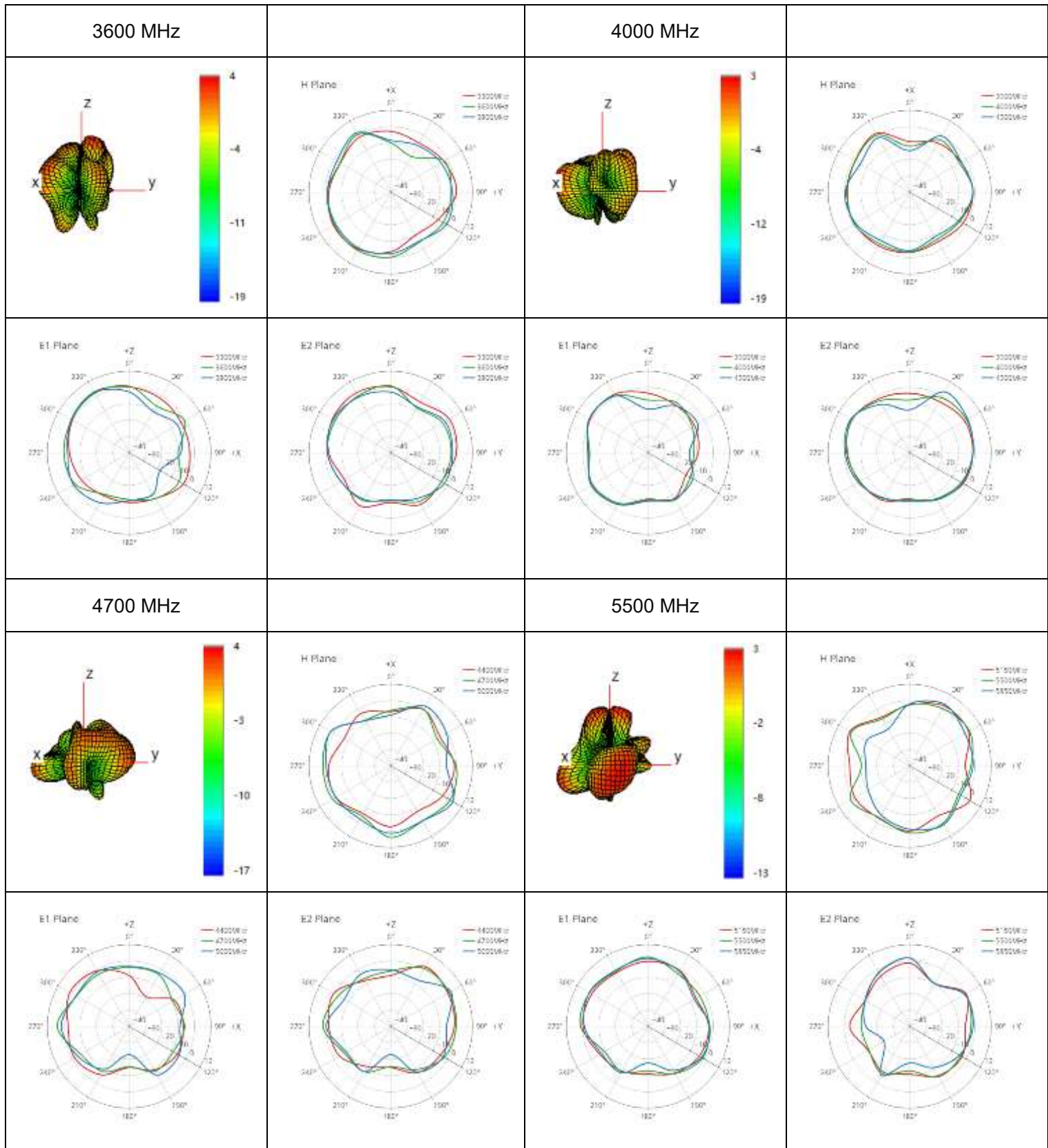
● **LMH3**



● **LMH3**

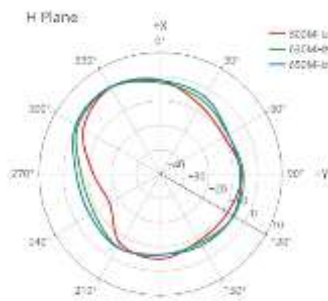
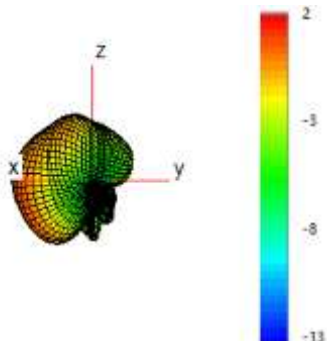


● **LMH3**

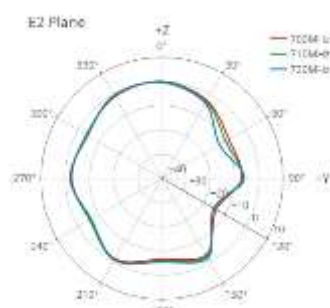
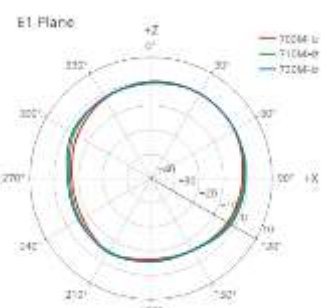
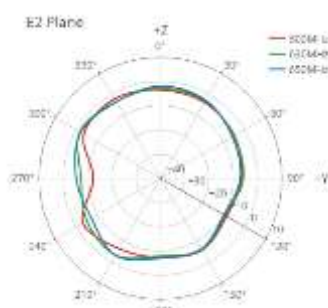
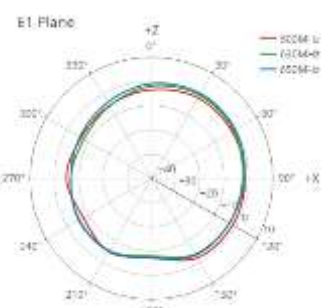
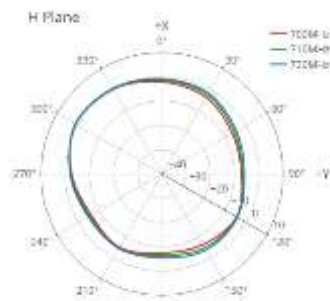
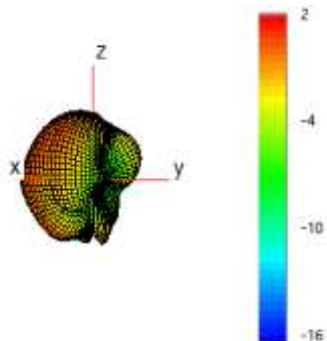


● **LMH4**

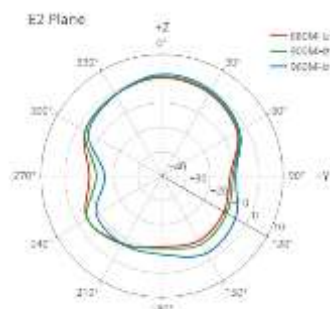
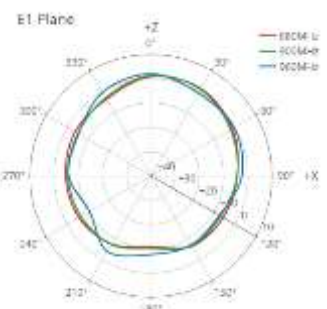
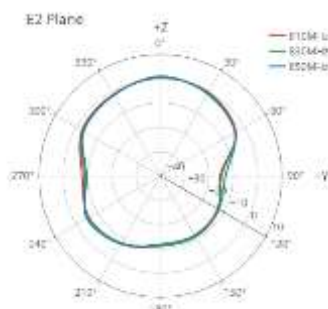
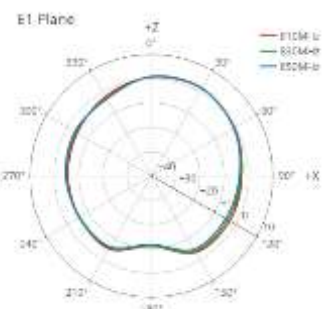
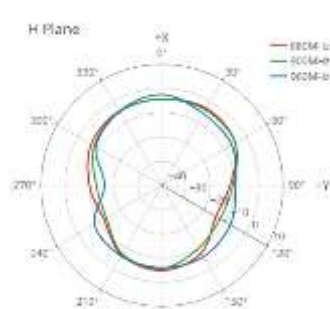
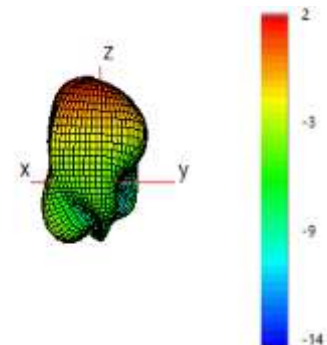
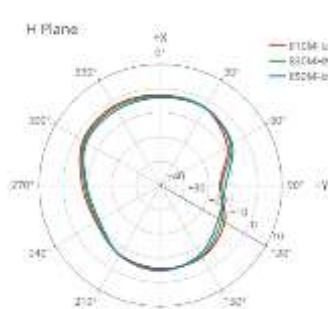
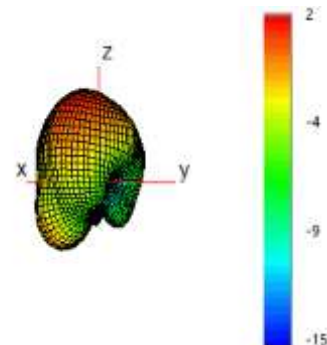
630 MHz



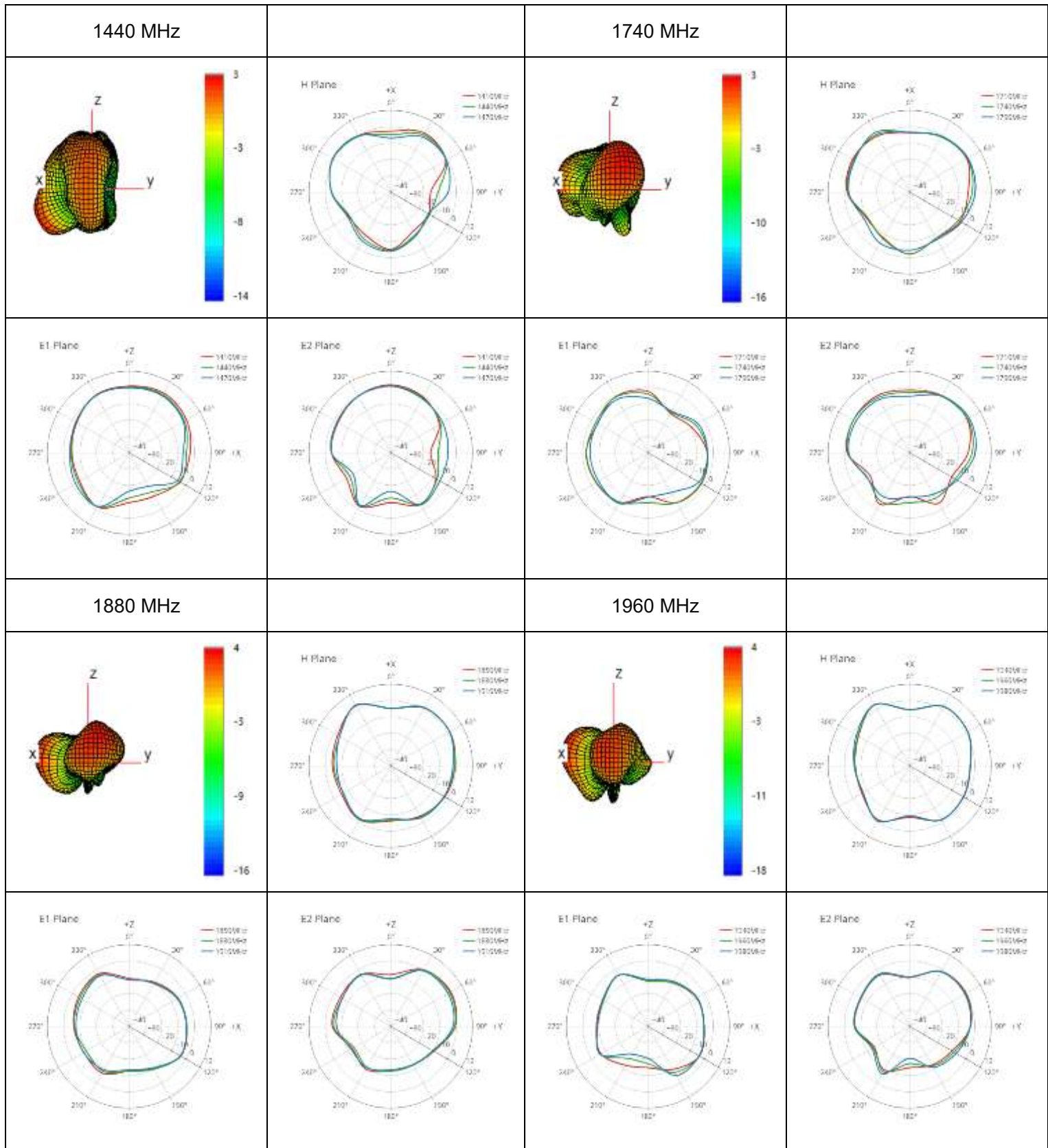
710 MHz



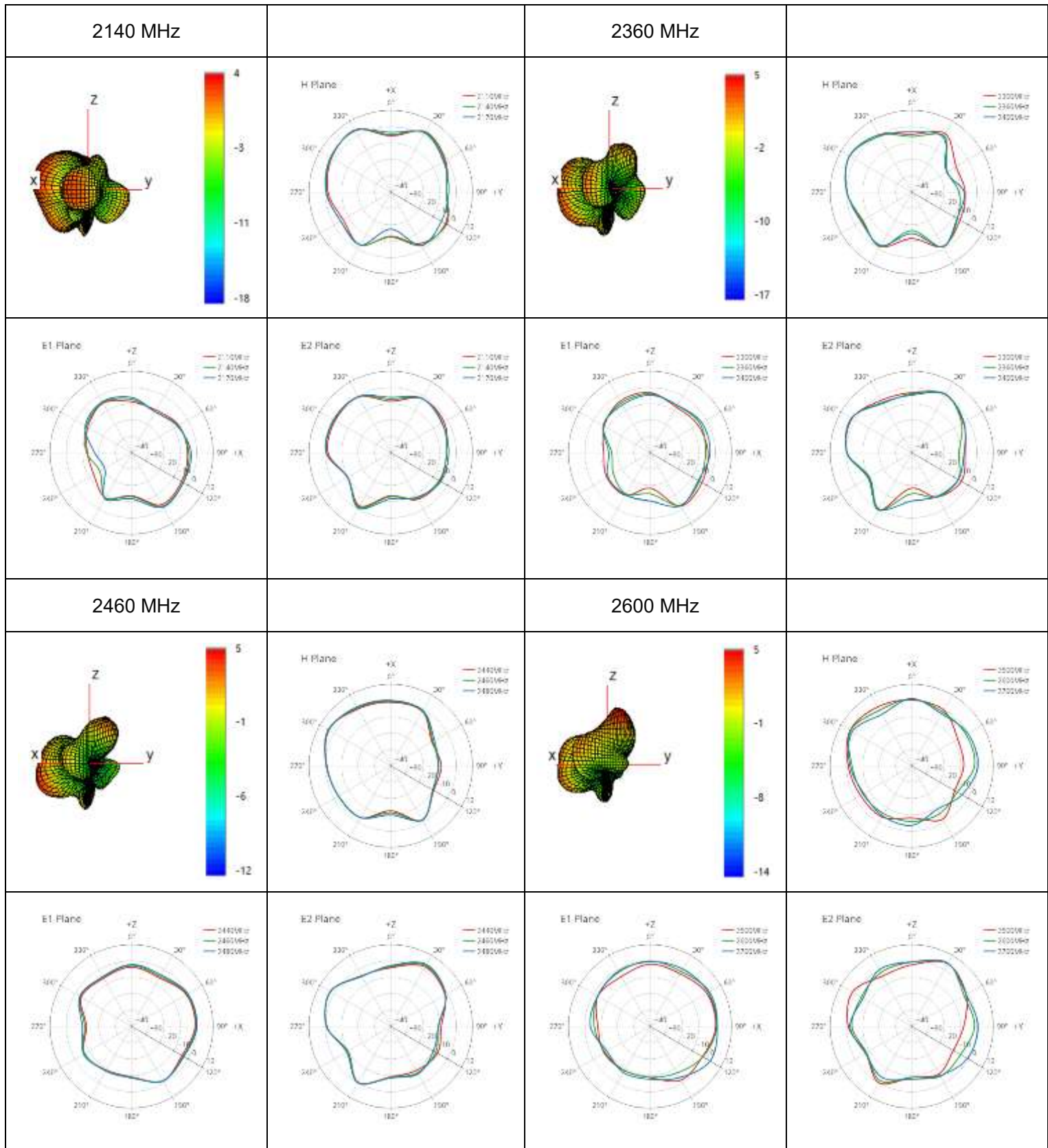
830 MHz



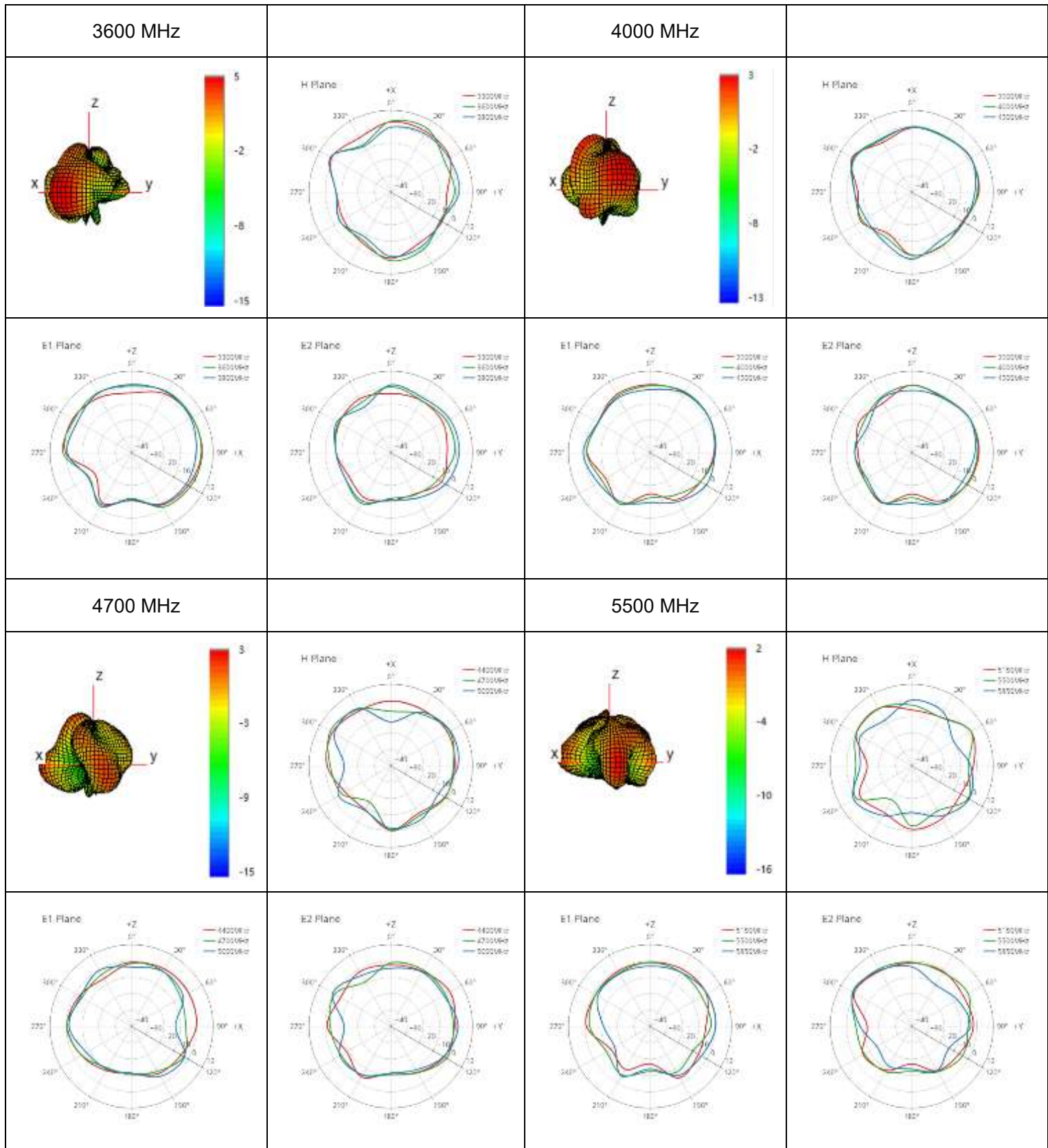
● **LMH4**



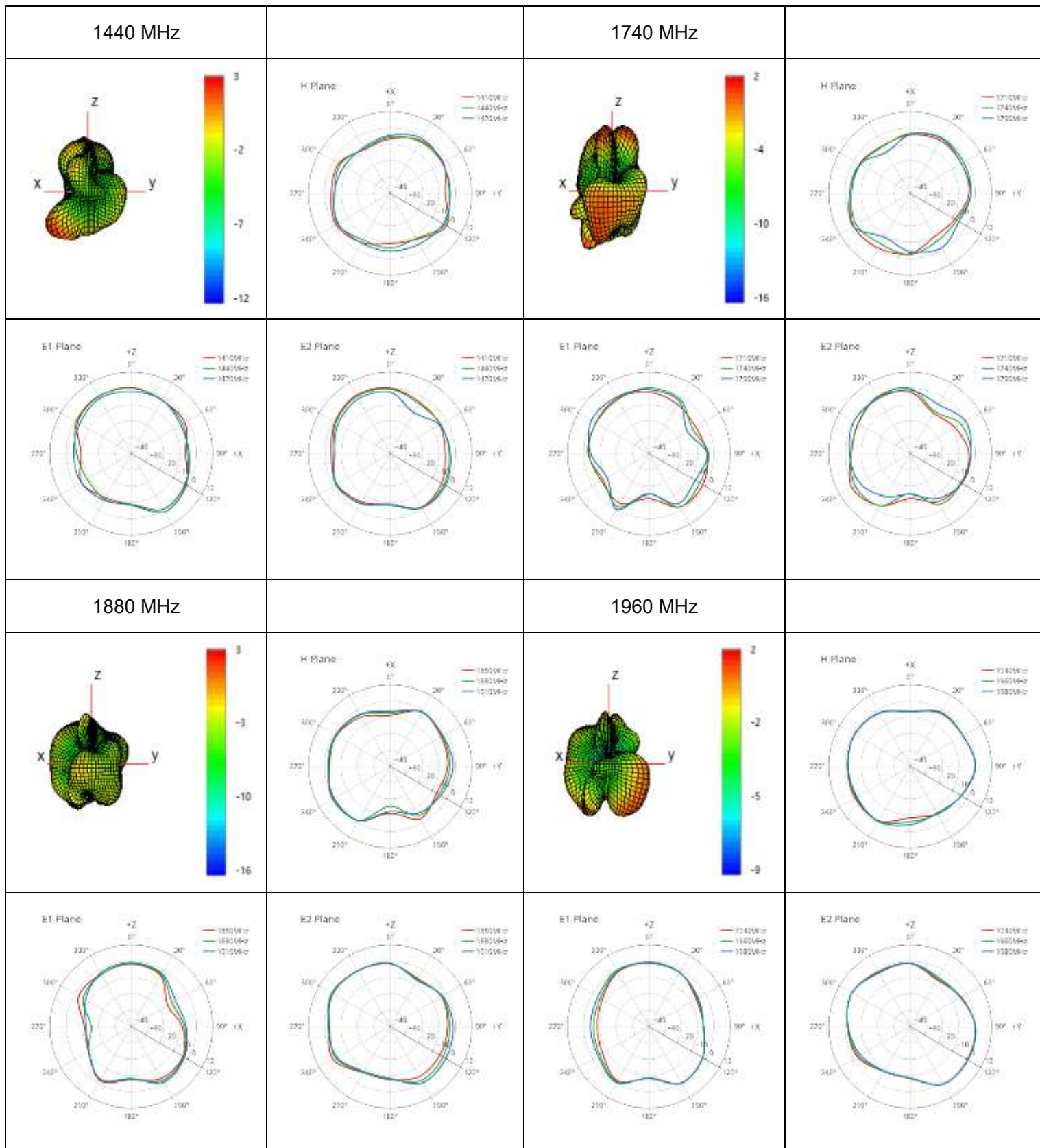
● **LMH4**



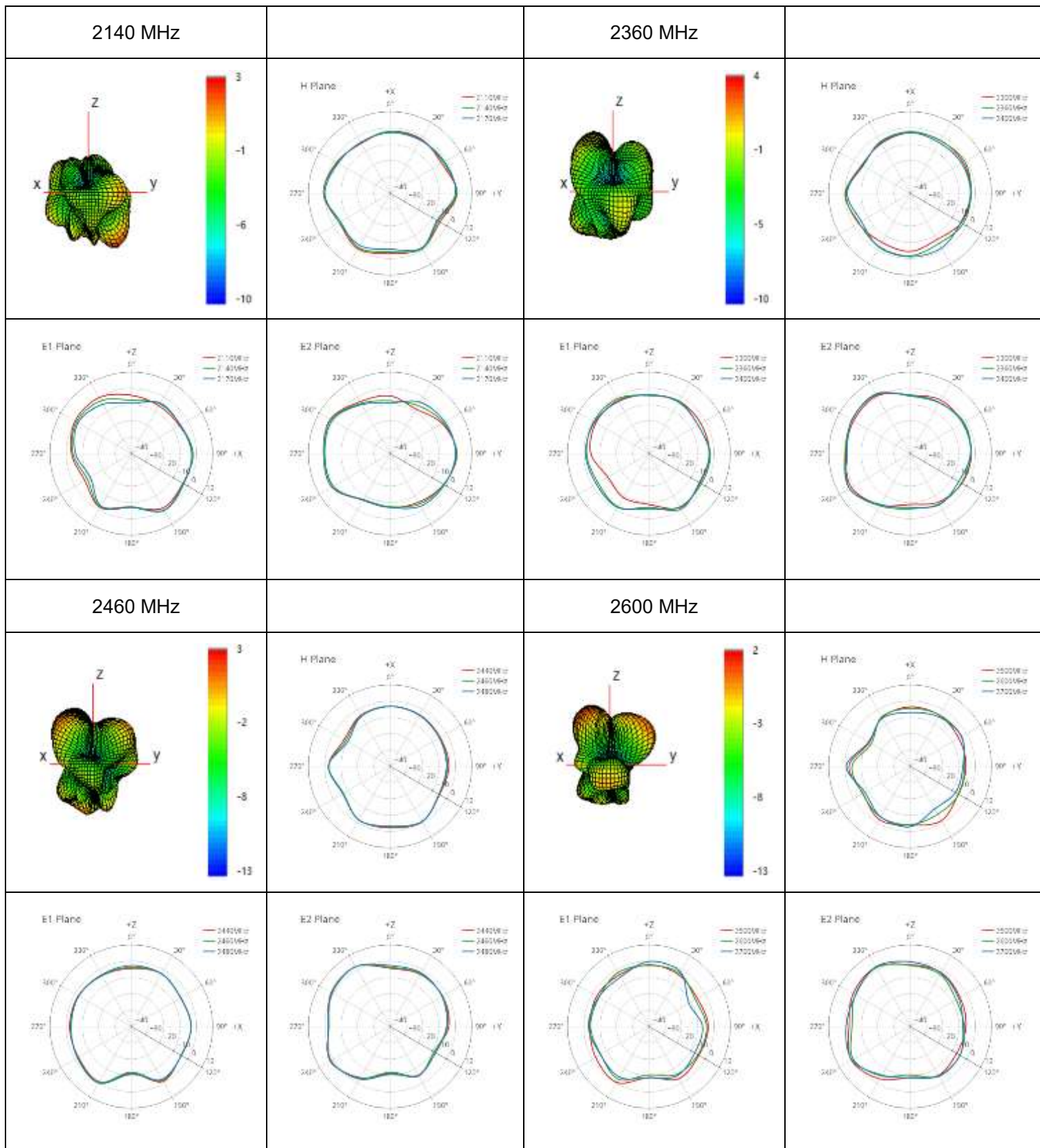
● **LMH4**



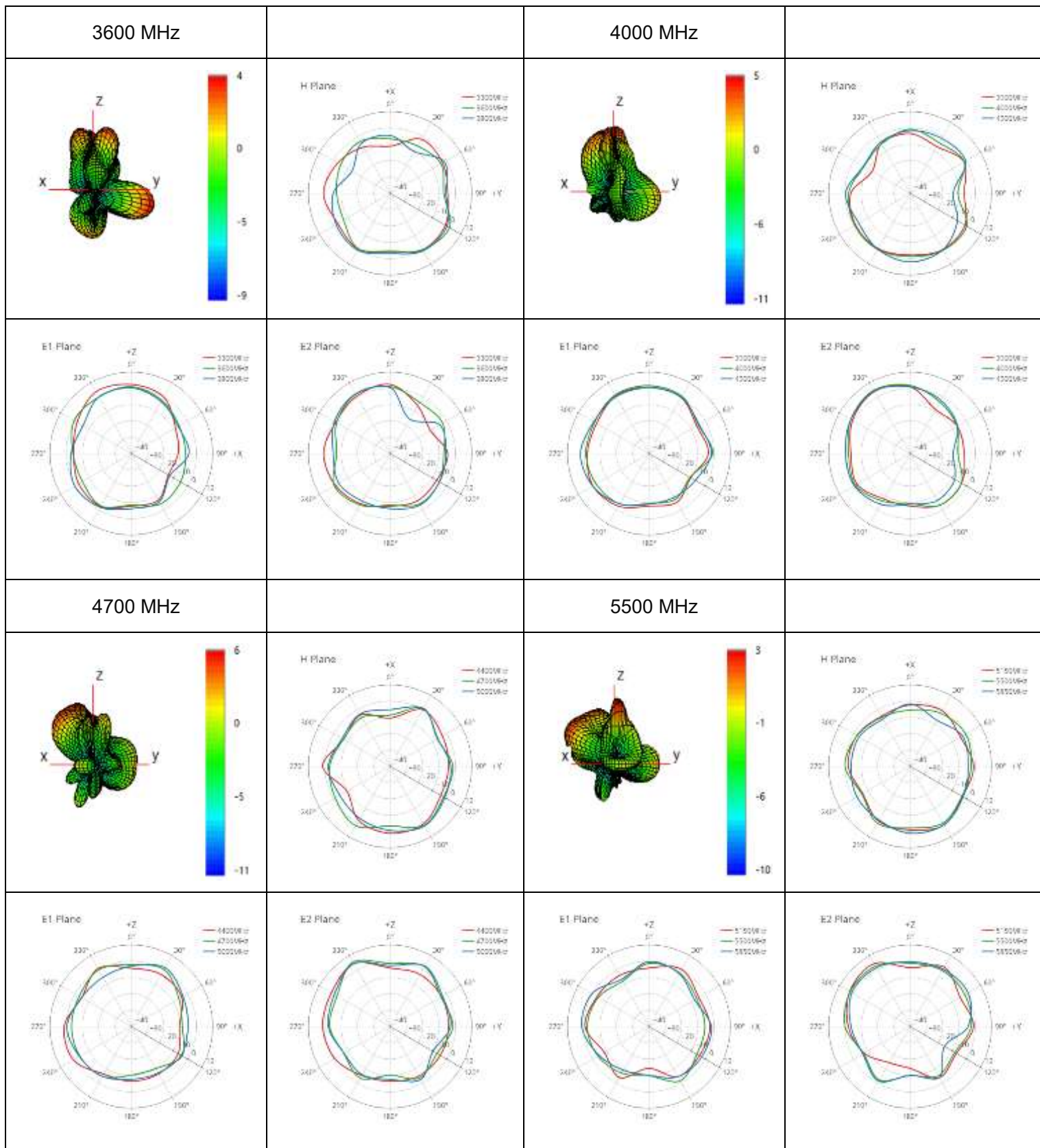
● **MH1**



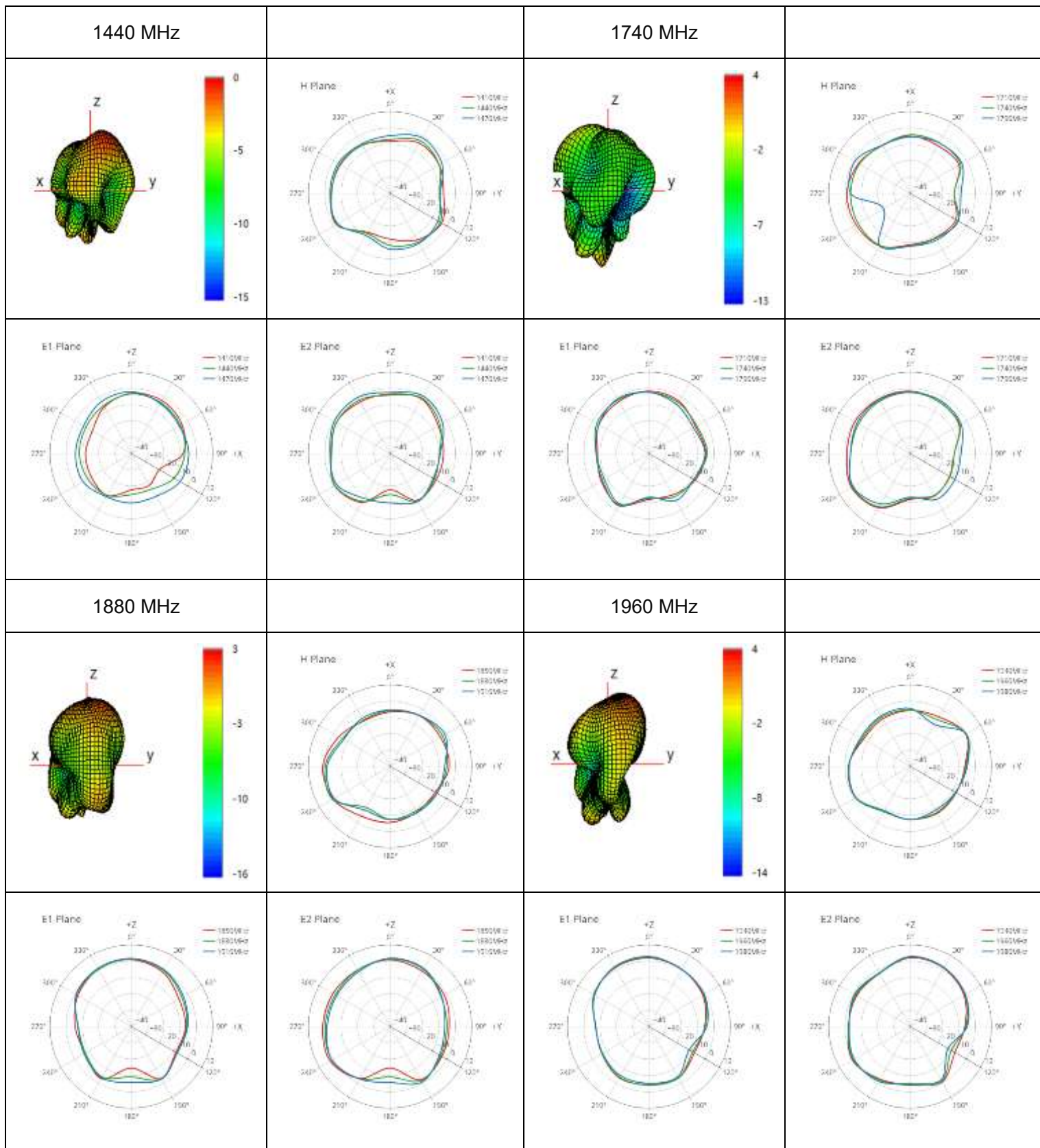
● **MH1**



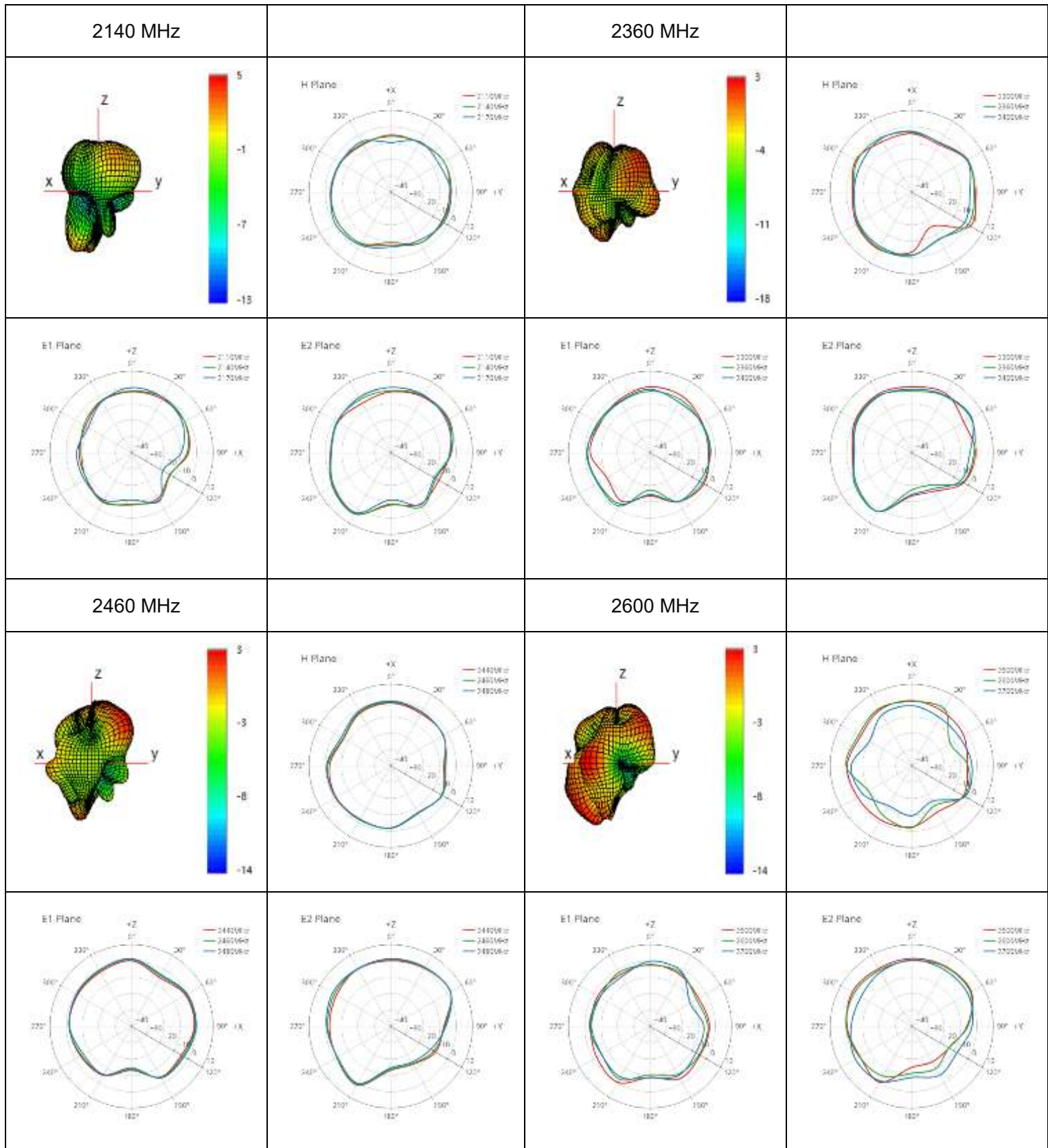
● **MH1**



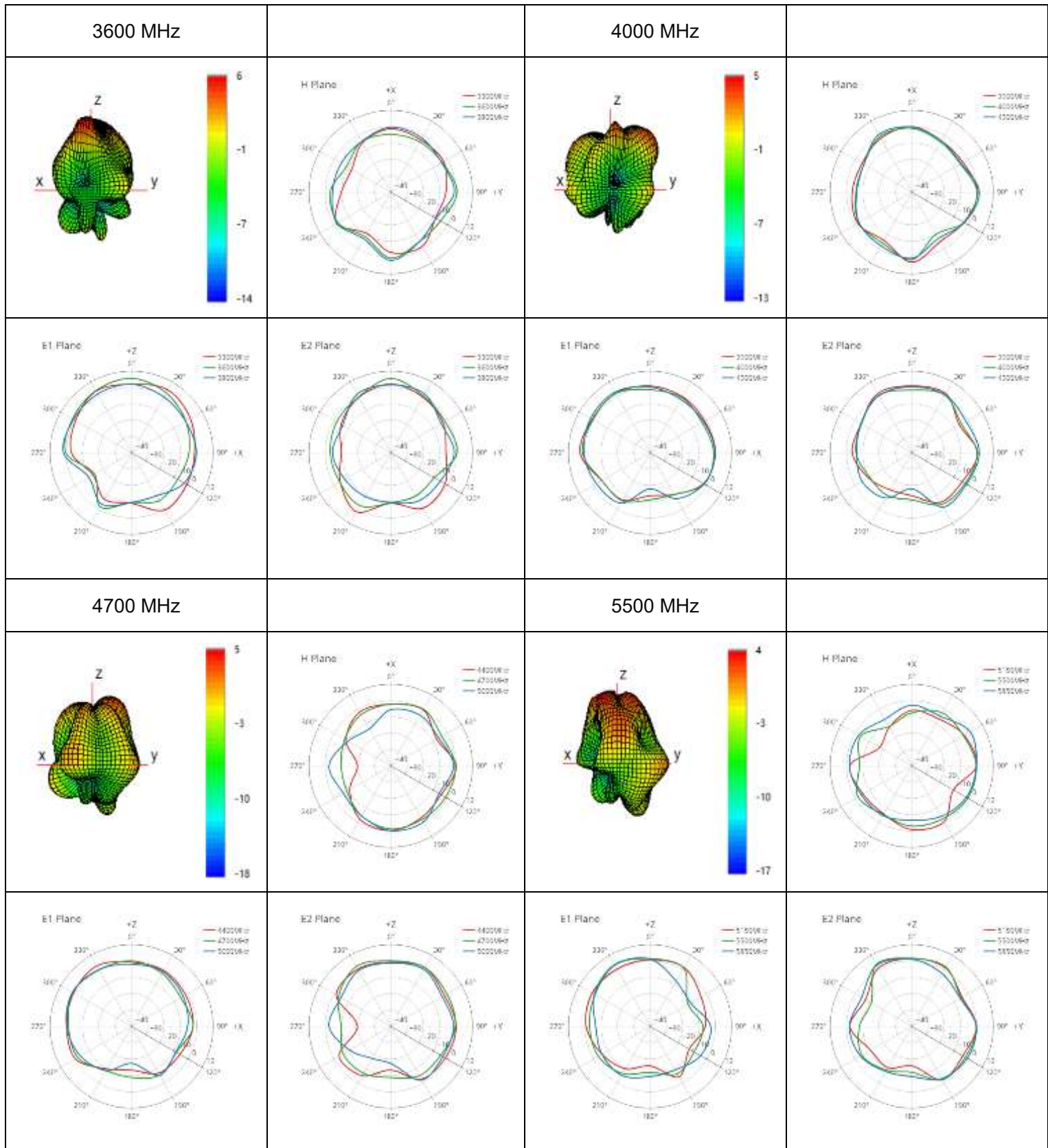
● **MH2**



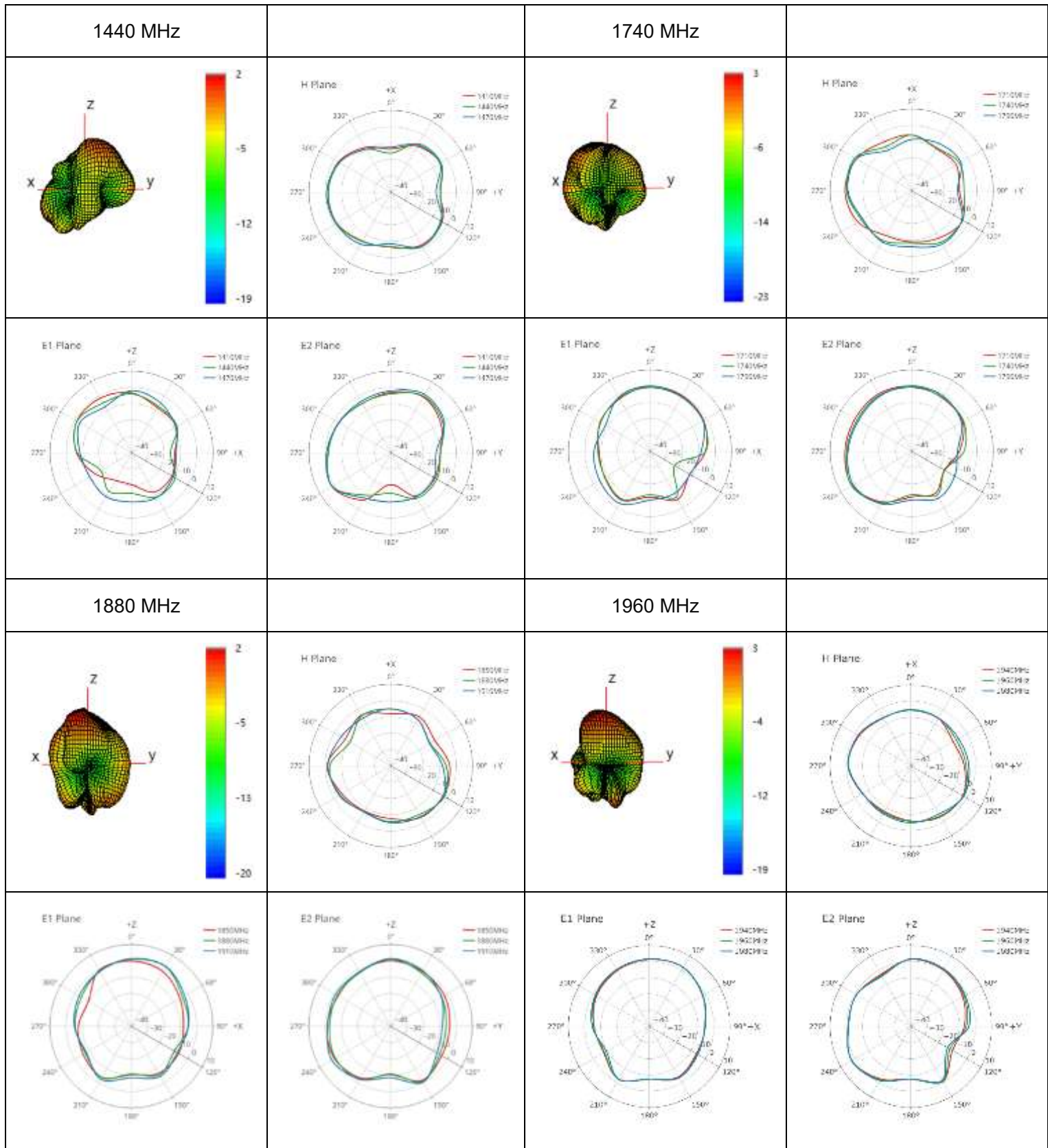
● **MH2**



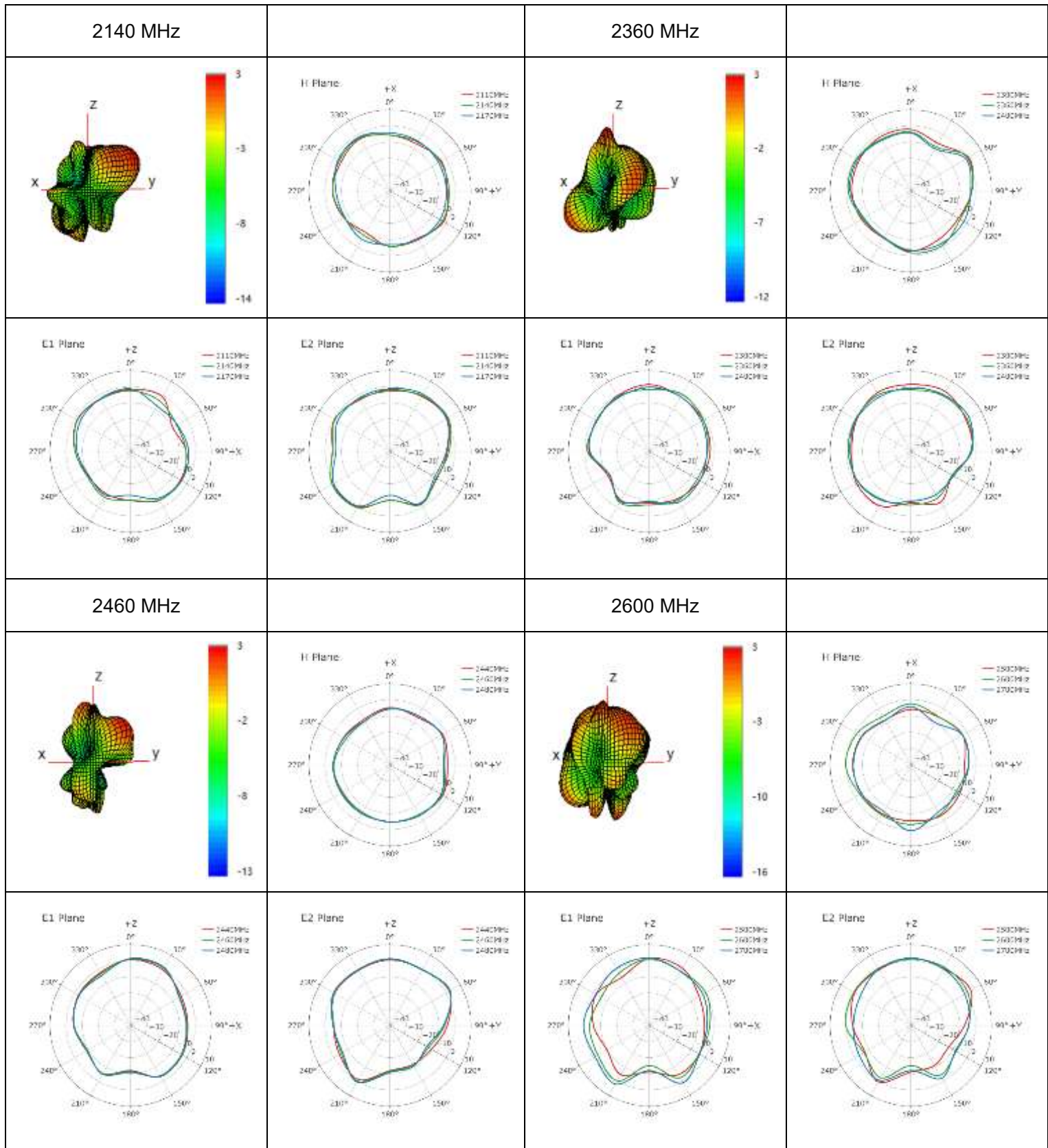
● **MH2**



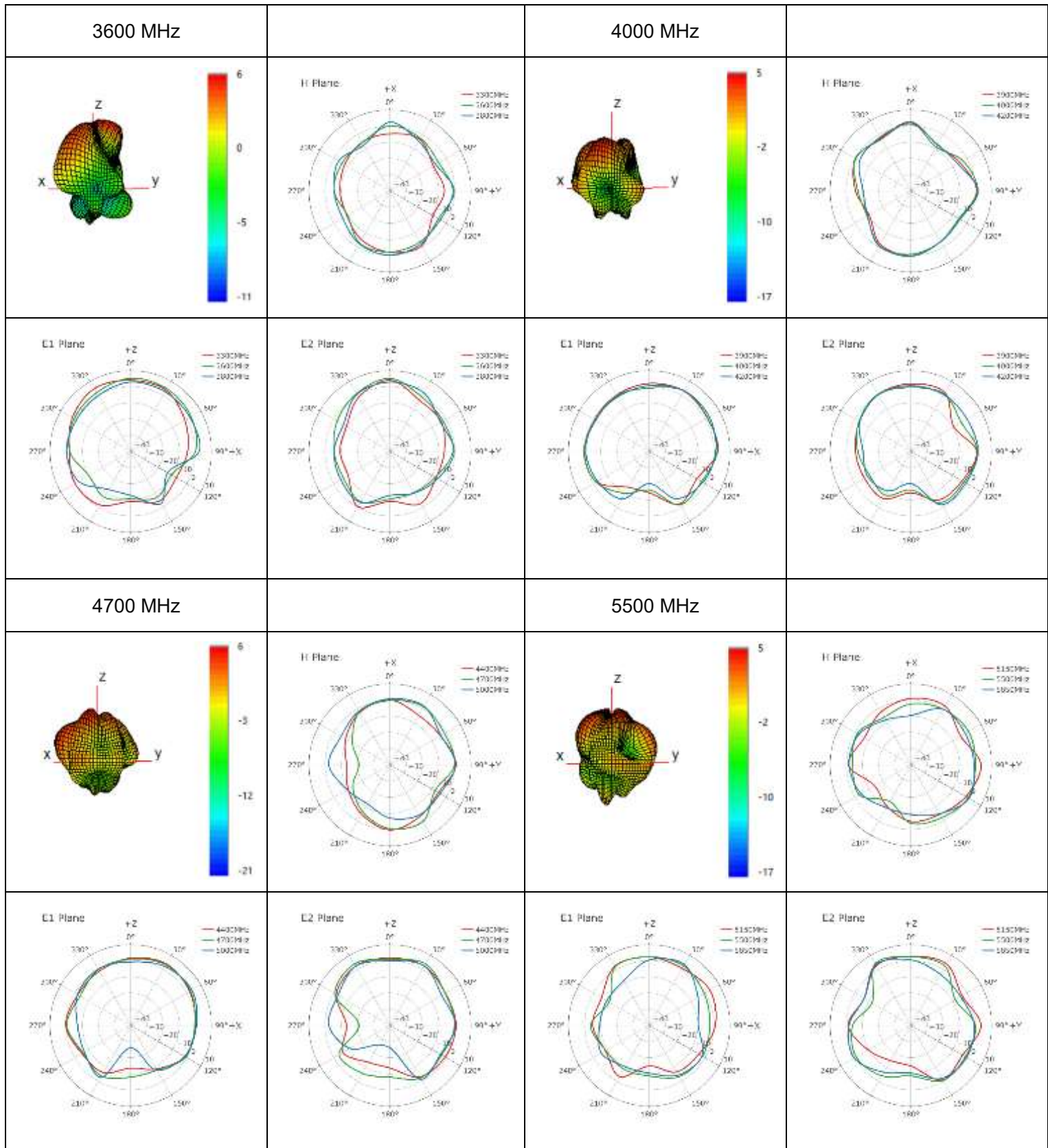
● **MH3**



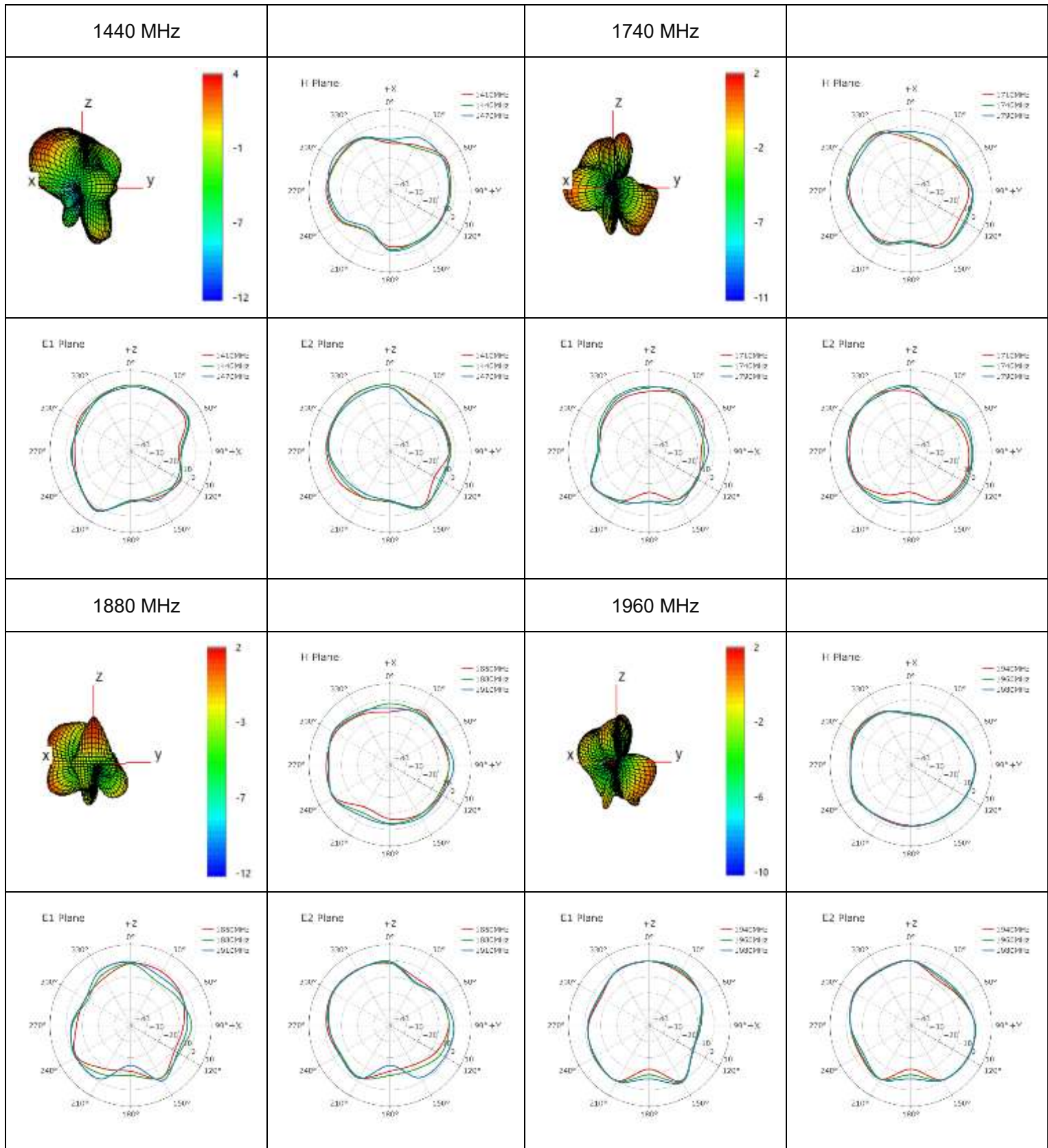
● **MH3**



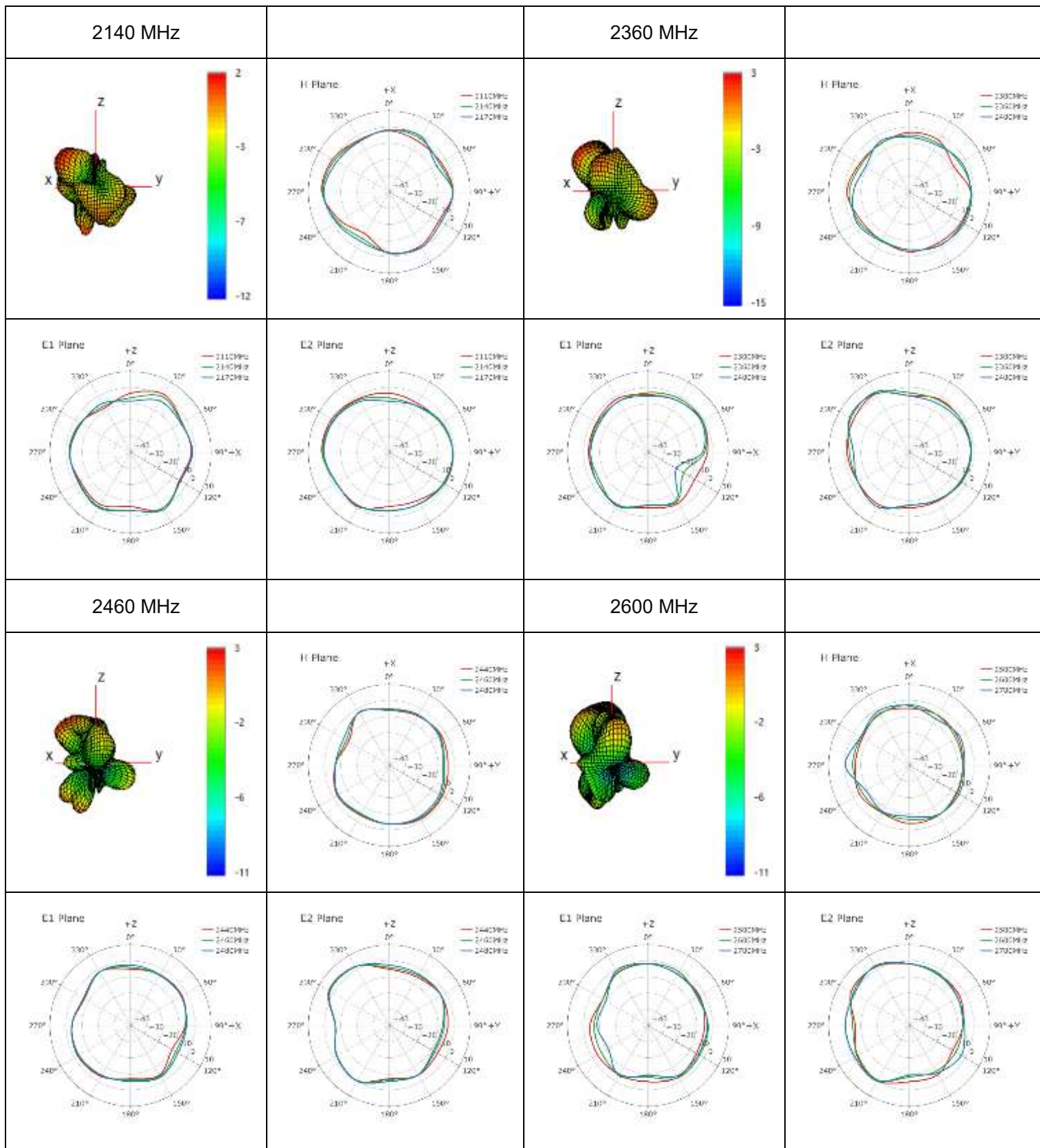
● **MH3**



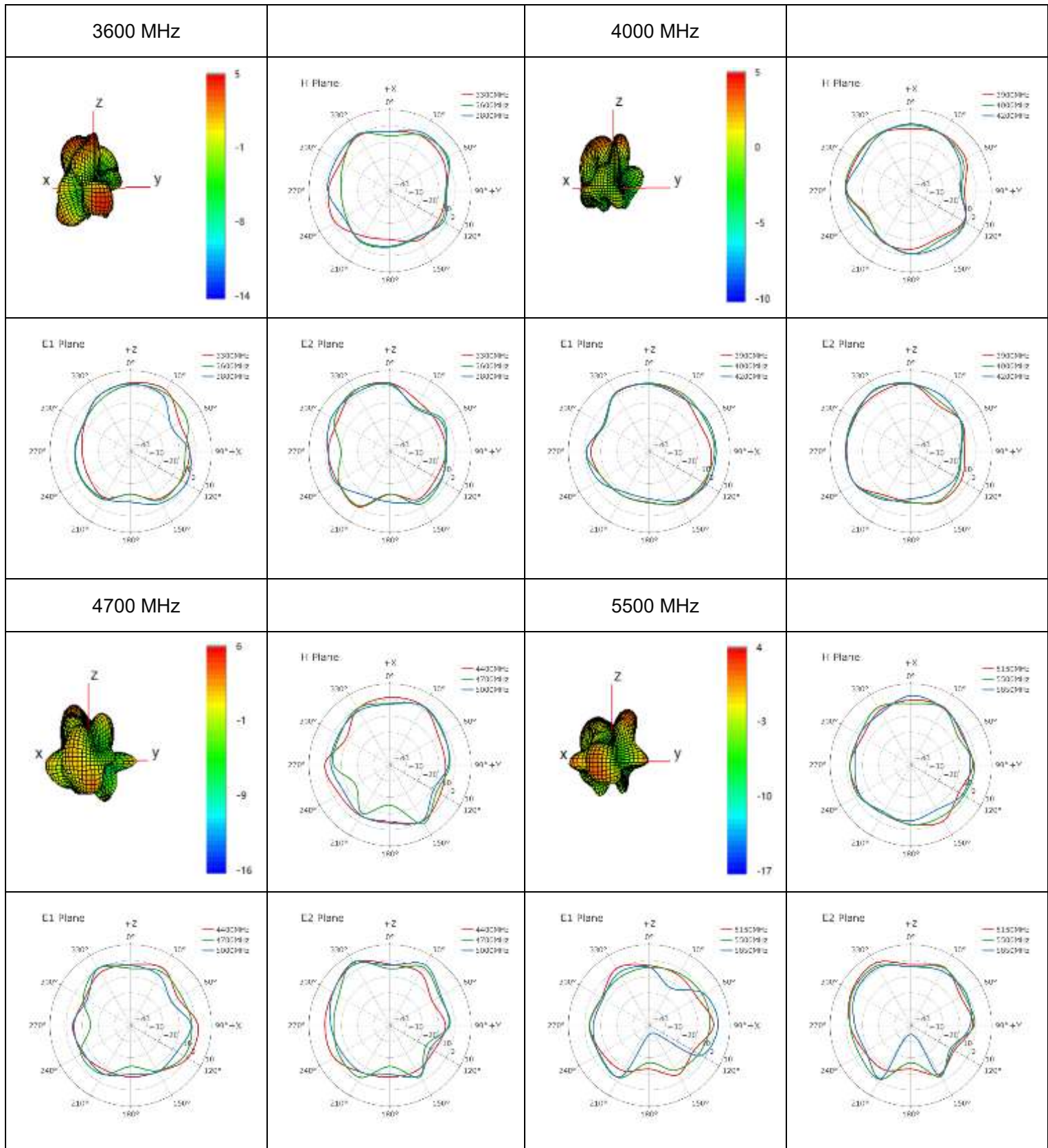
● **MH4**



● **MH4**

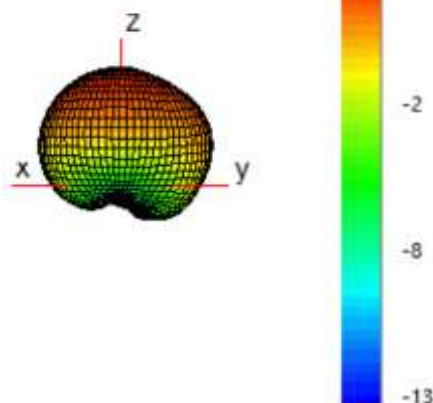


● **MH4**

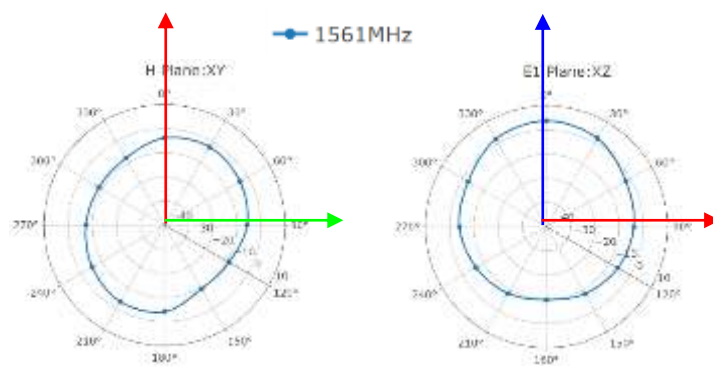
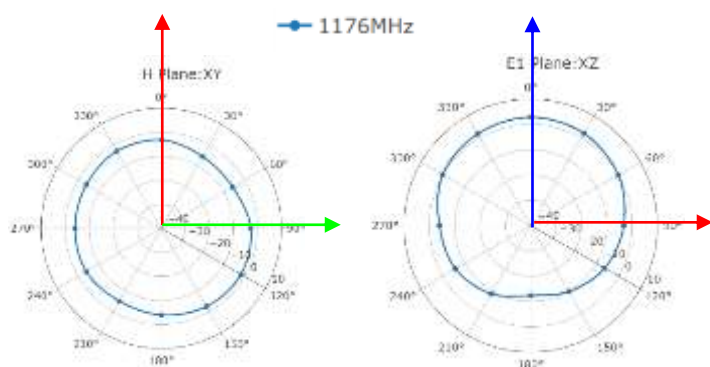
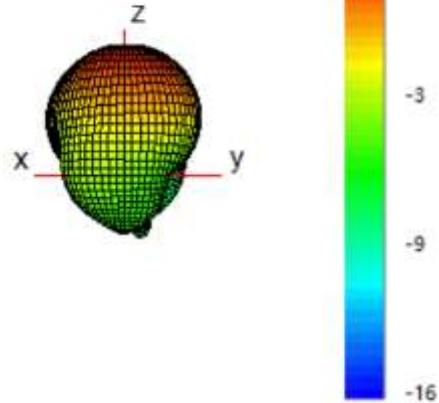


● **GNSS**

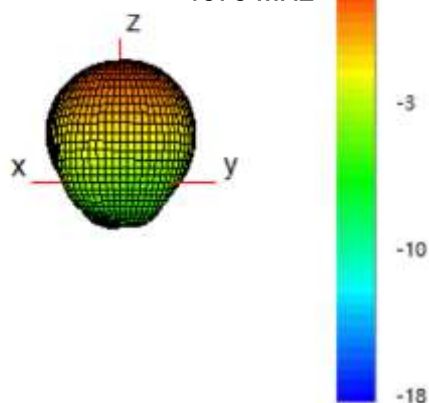
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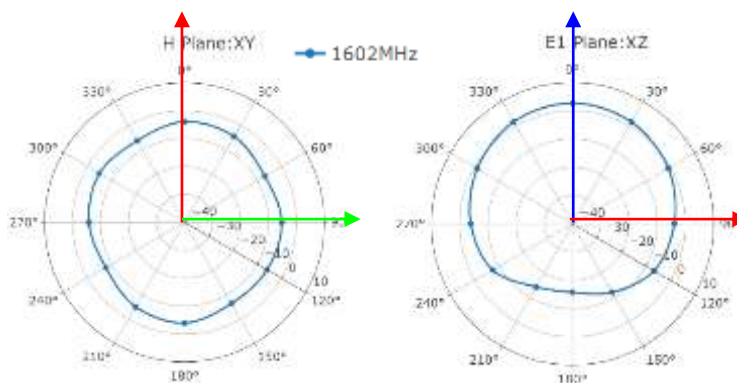
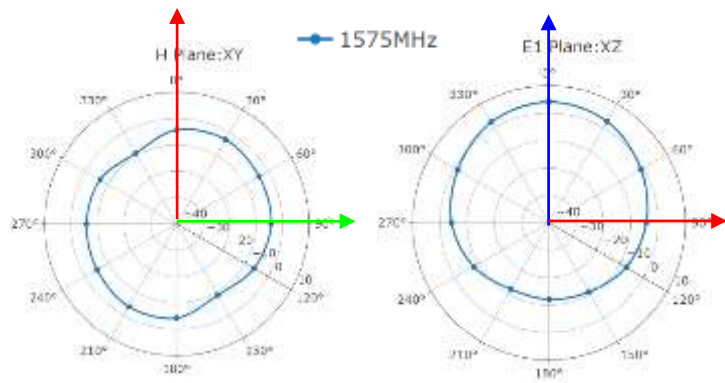
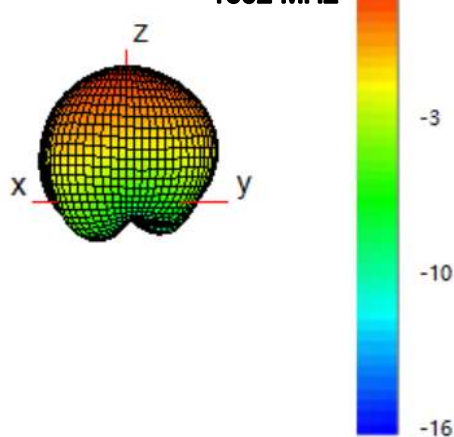
1561 MHz



1575 MHz

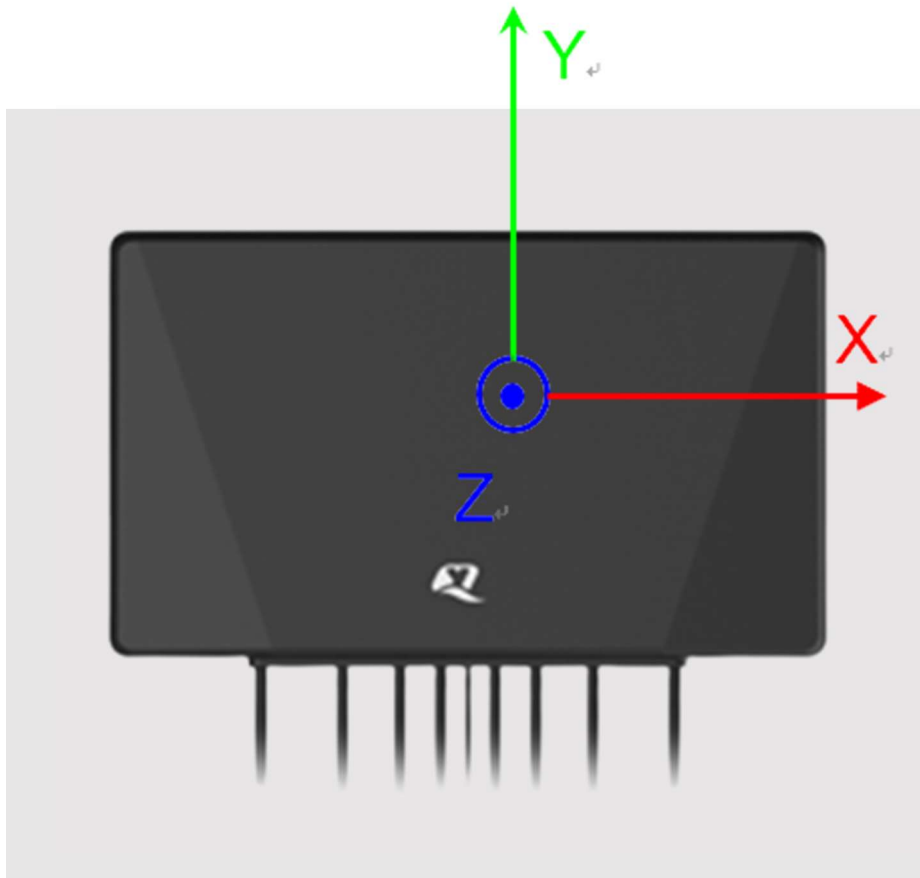


1602 MHz



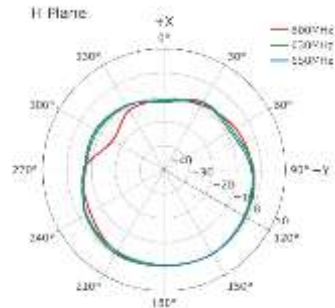
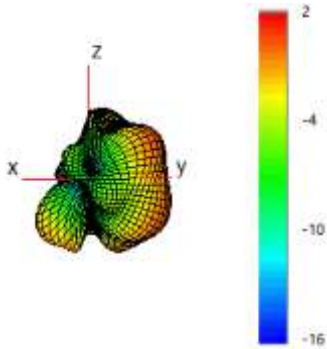
3.2.5.2. Test Condition: On 500 ×500 mm Metal Plane

- Test Chamber: HF-G-1

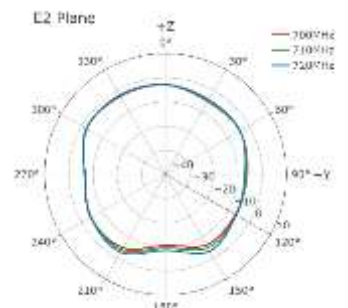
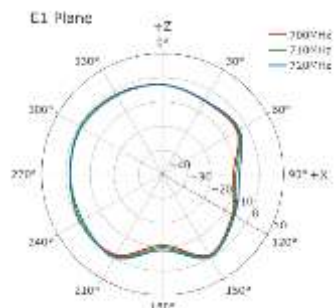
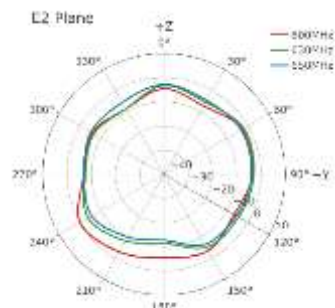
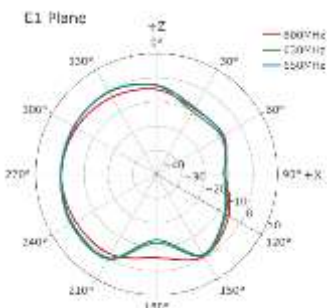
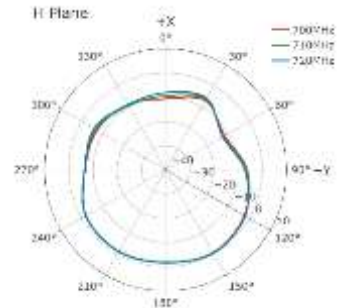
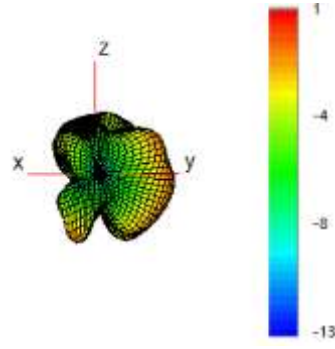


● **LMH1**

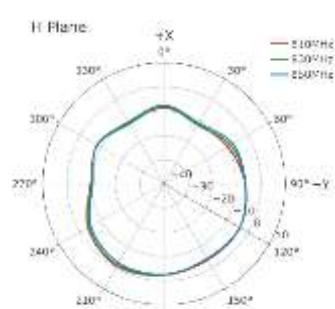
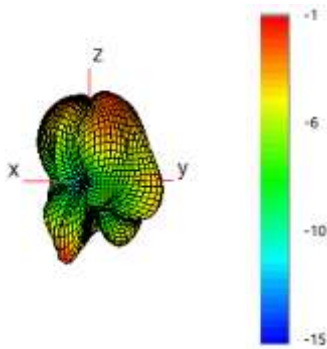
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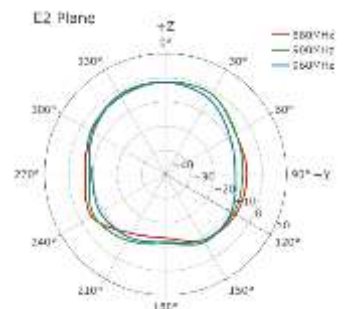
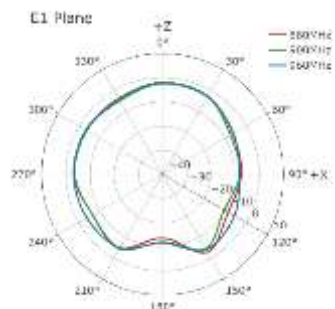
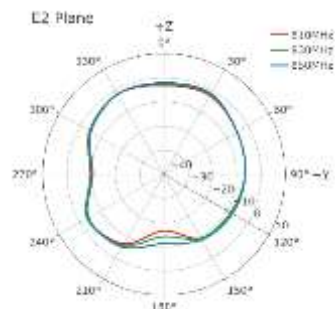
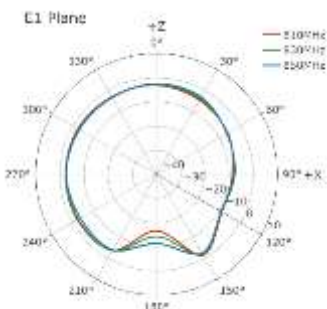
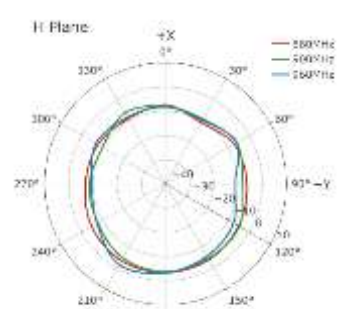
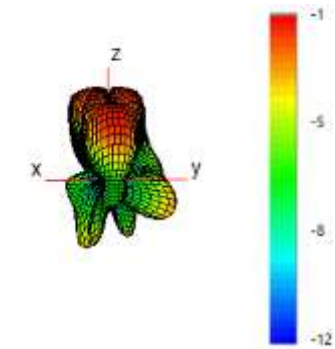
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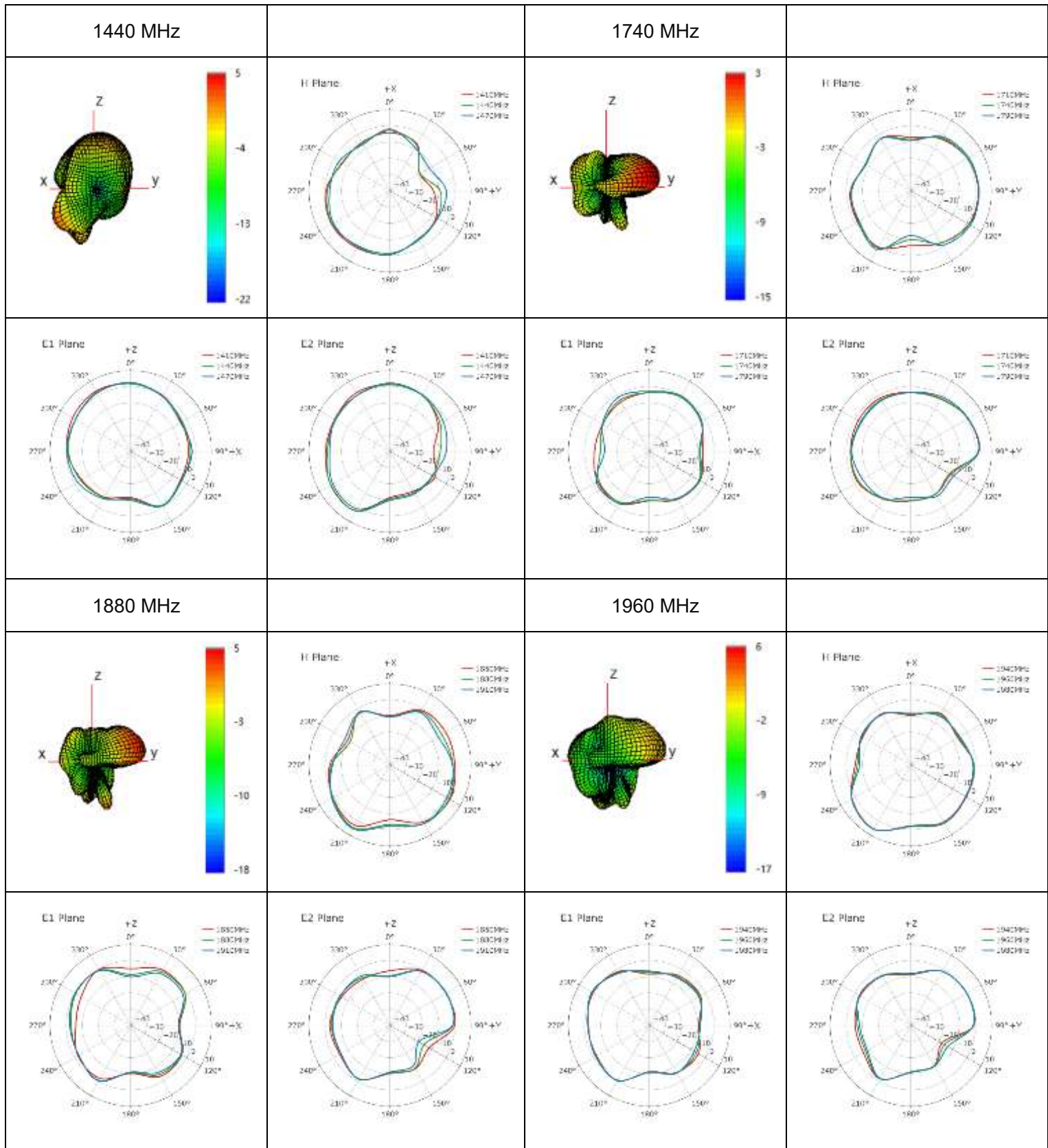
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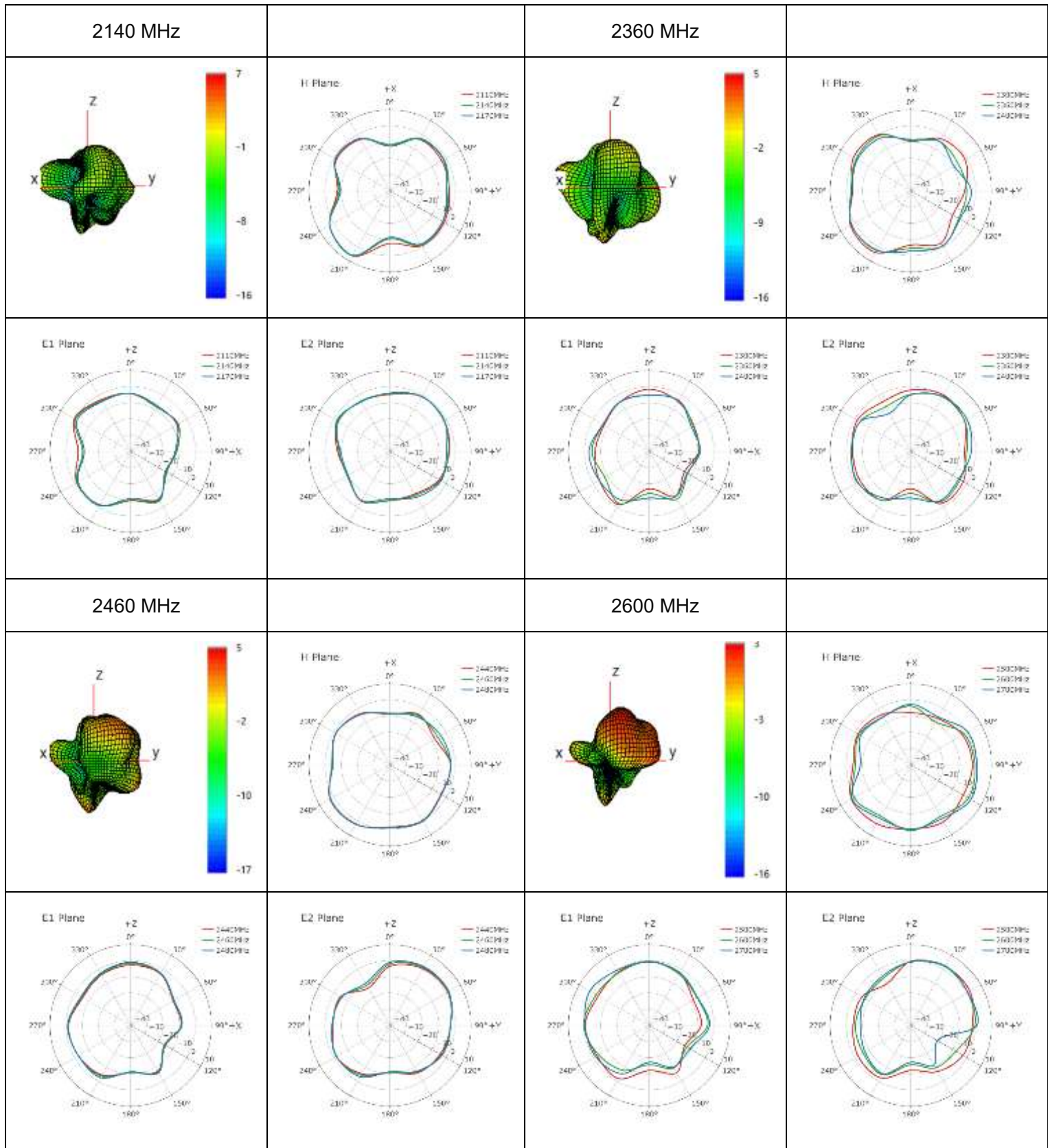
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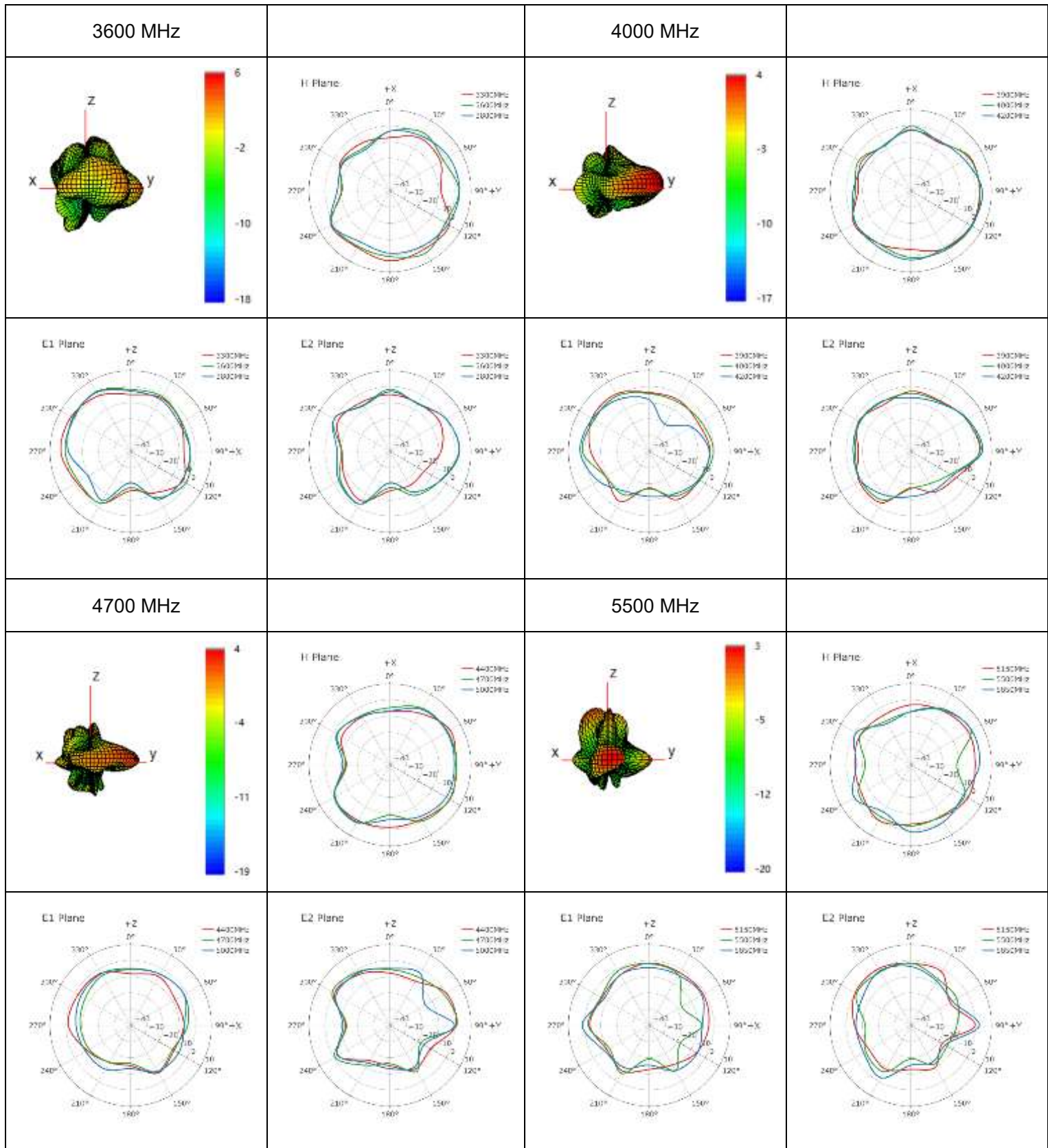
● **LMH1**



● **LMH1**

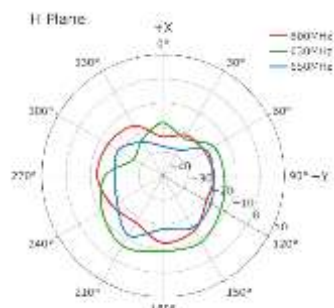
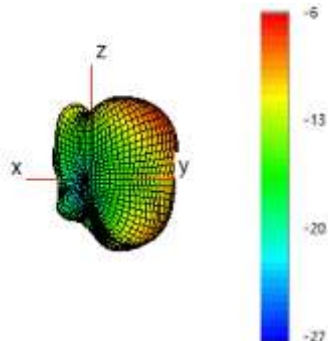


● **LMH1**

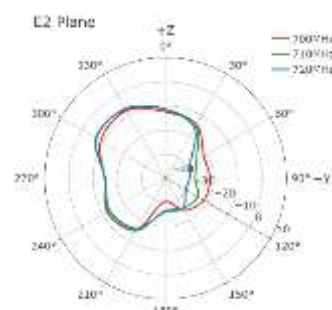
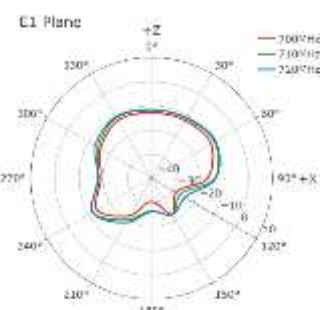
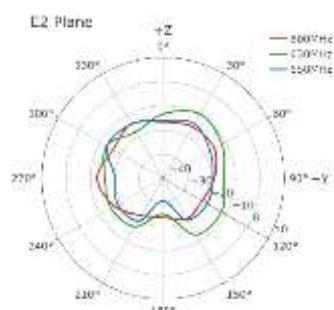
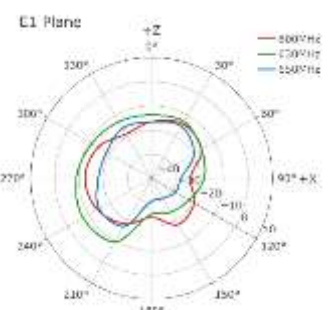
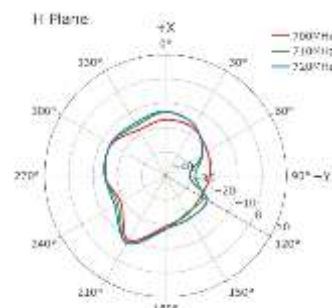
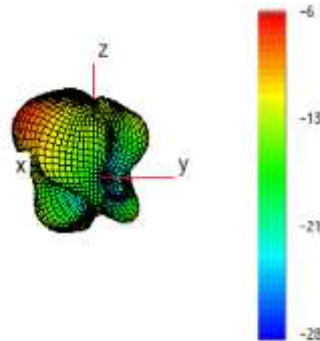


● **LMH2**

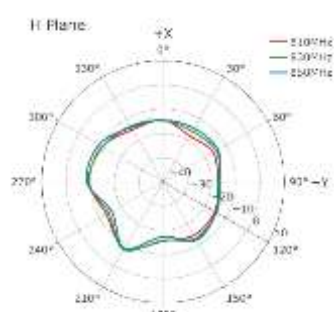
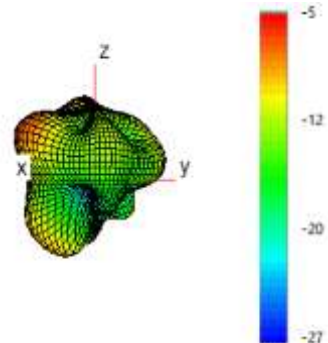
630 MHz



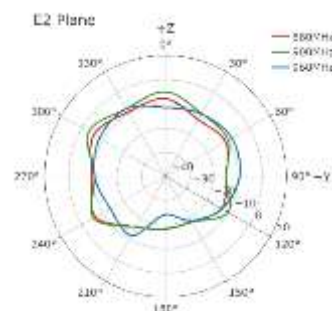
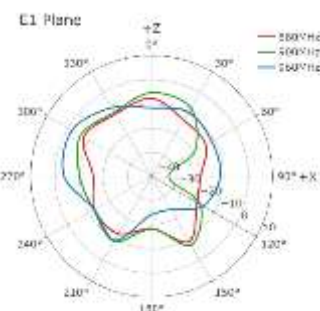
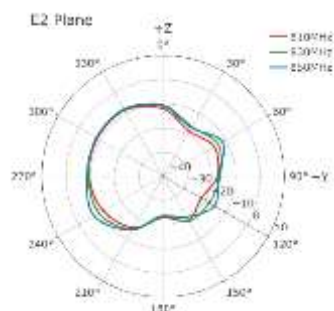
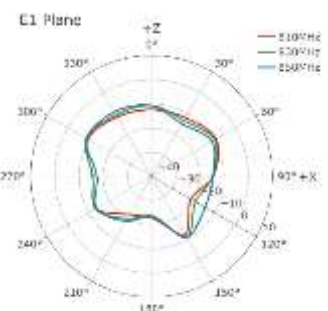
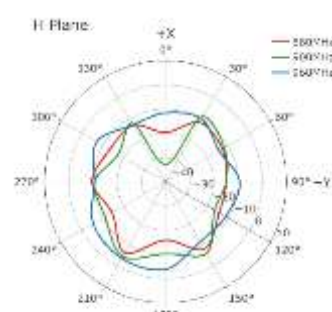
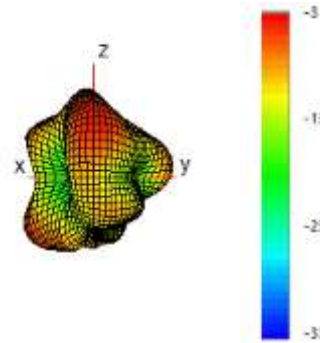
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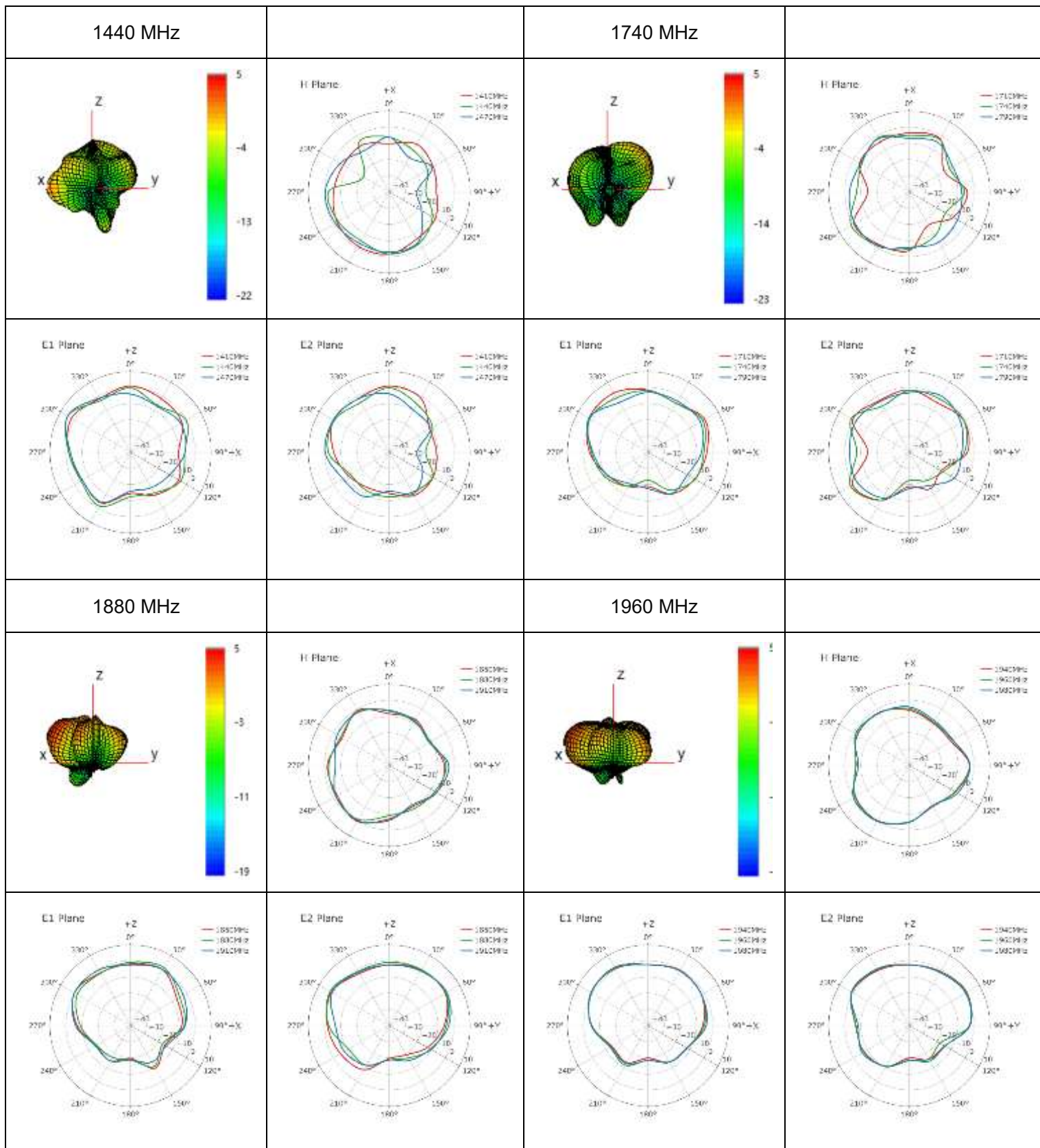
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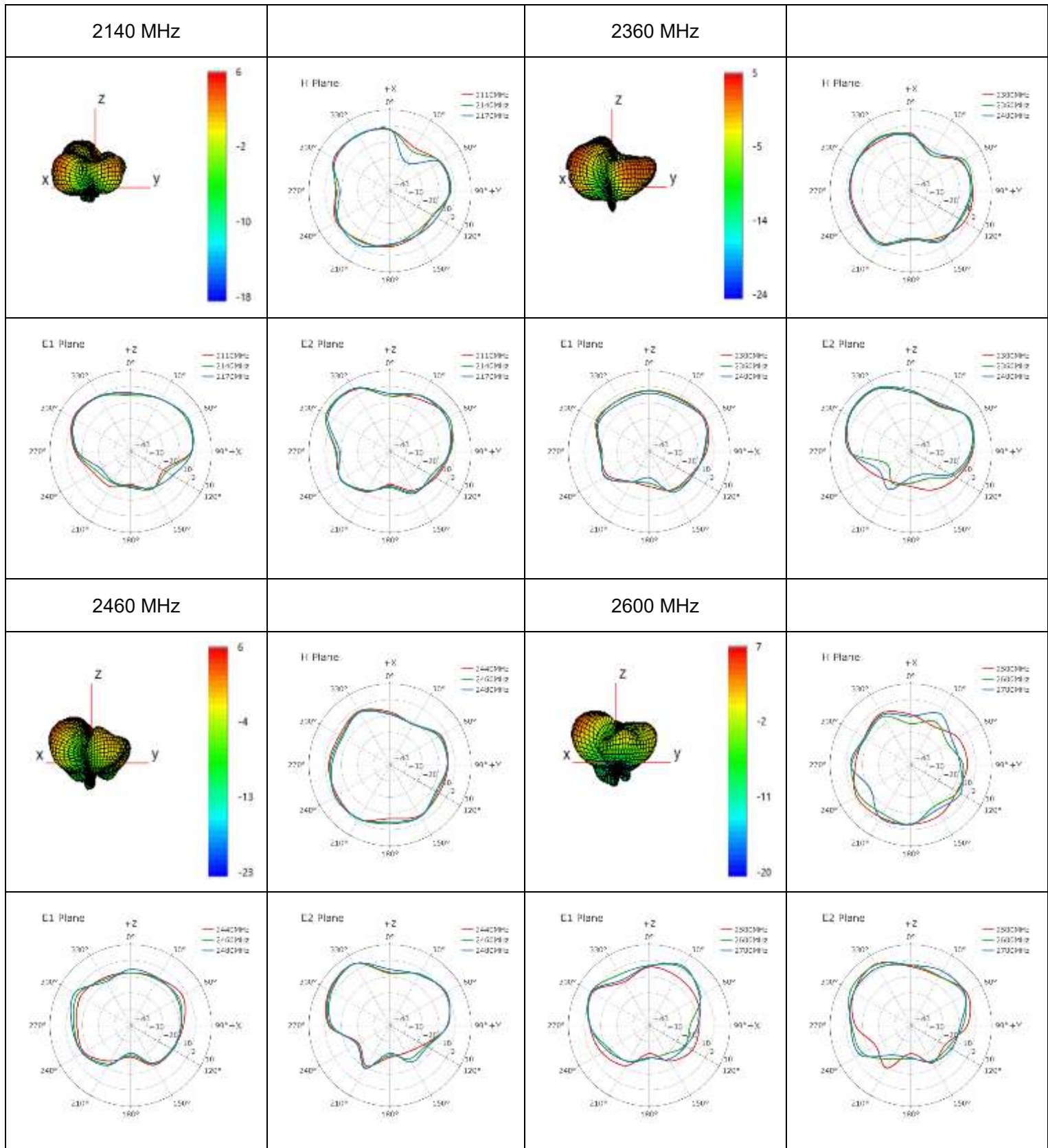
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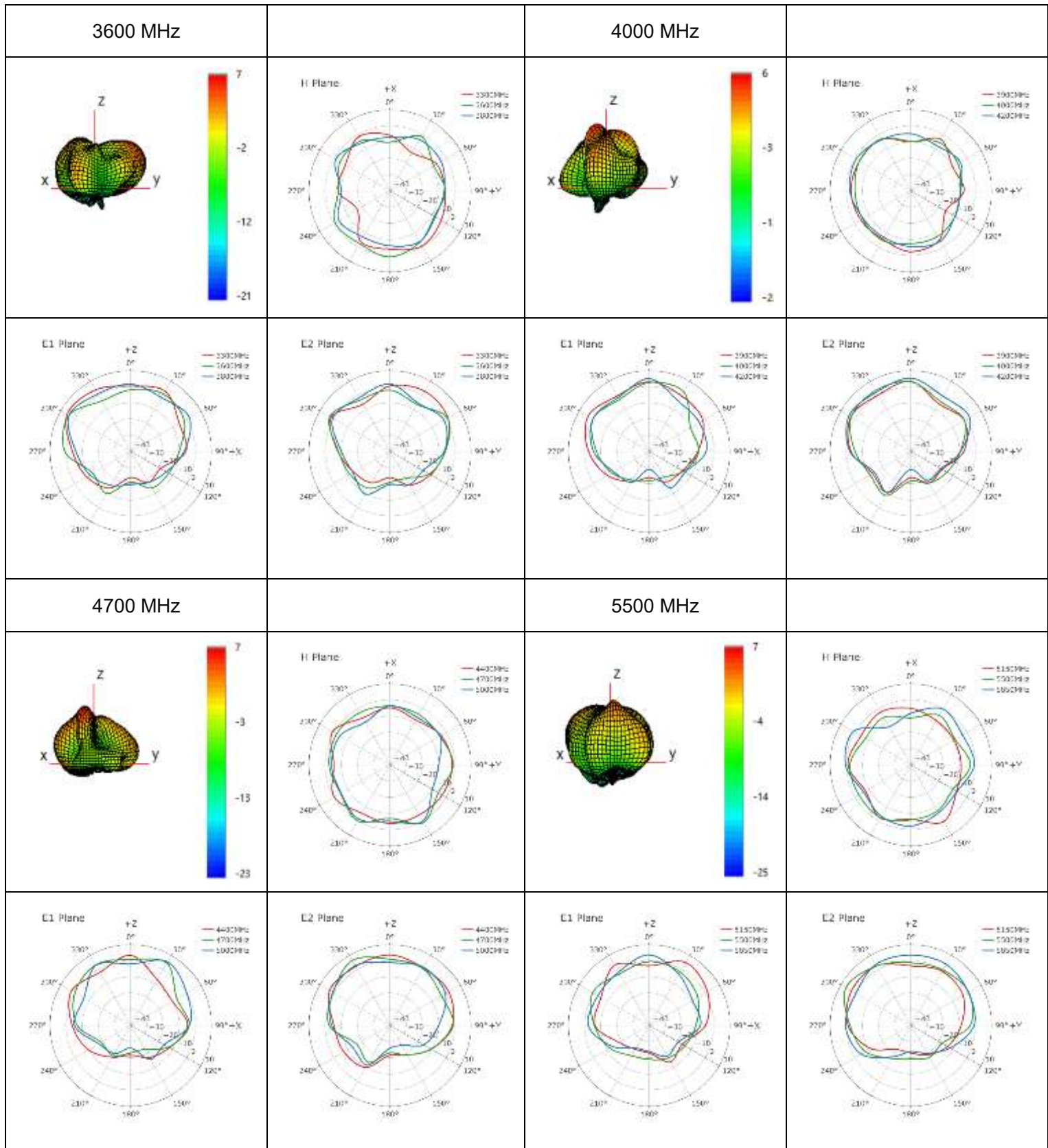
● **LMH2**



● **LMH2**

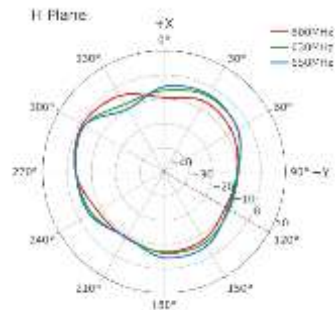
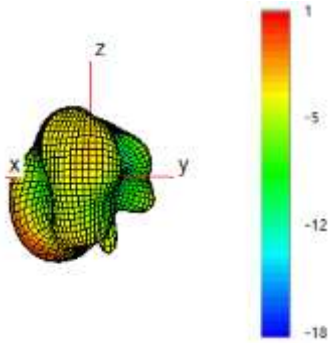


● **LMH2**

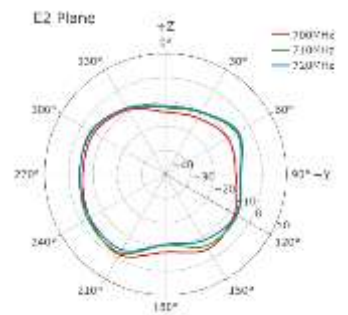
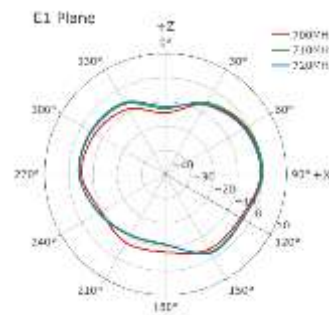
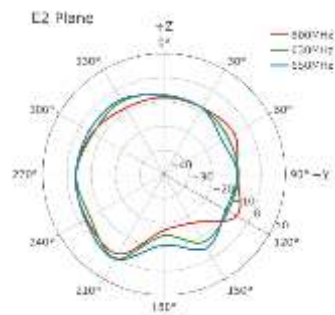
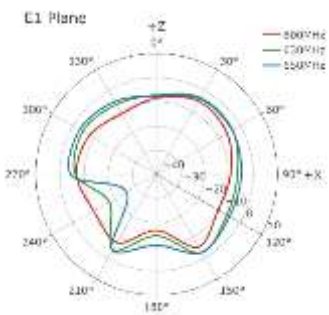
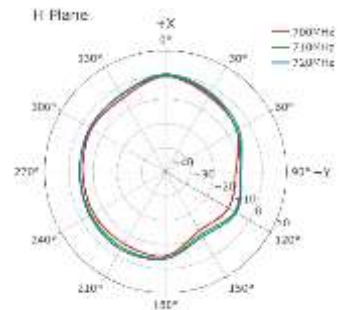
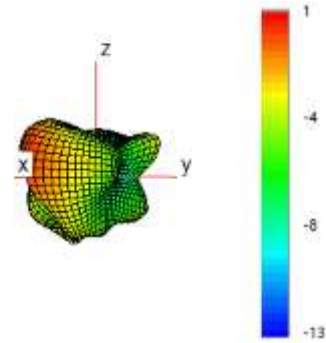


● **LMH3**

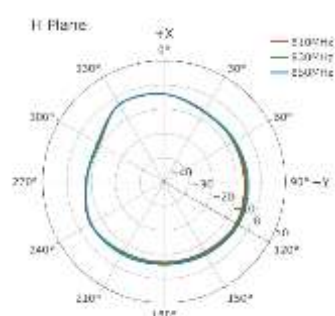
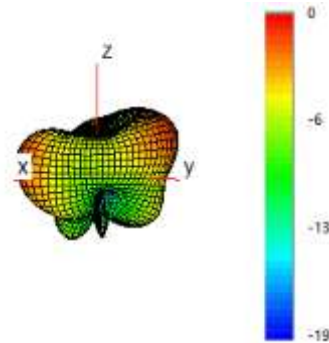
630 MHz



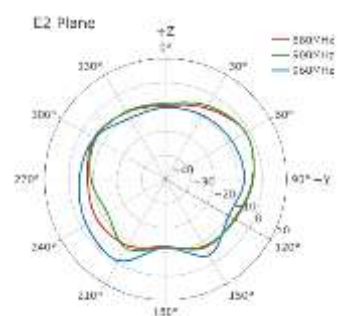
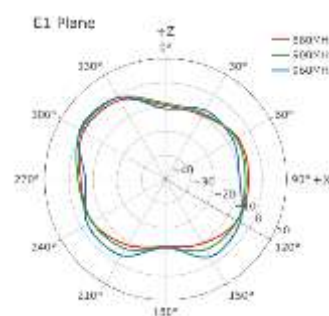
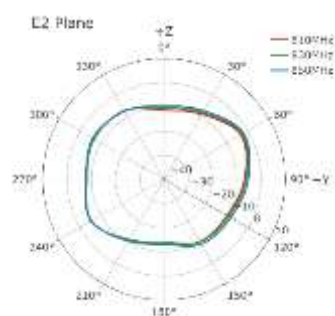
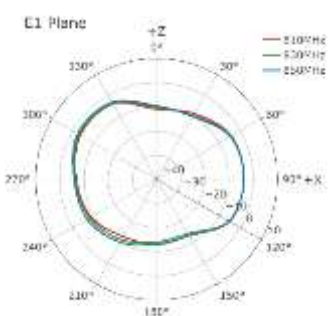
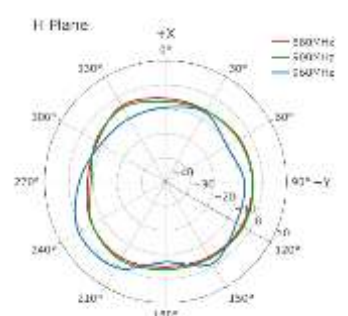
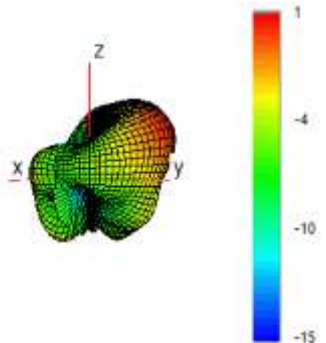
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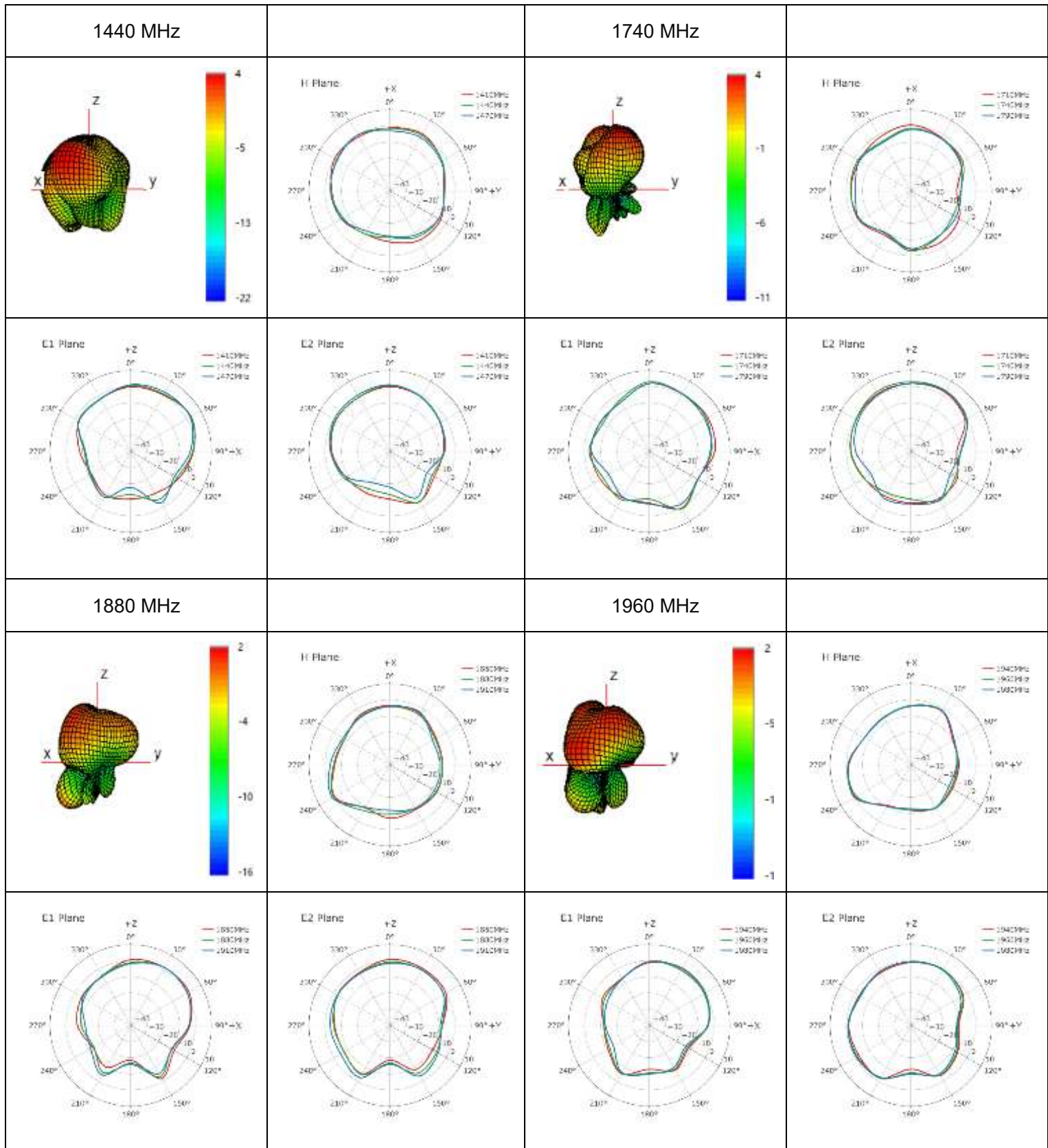
830 MHz



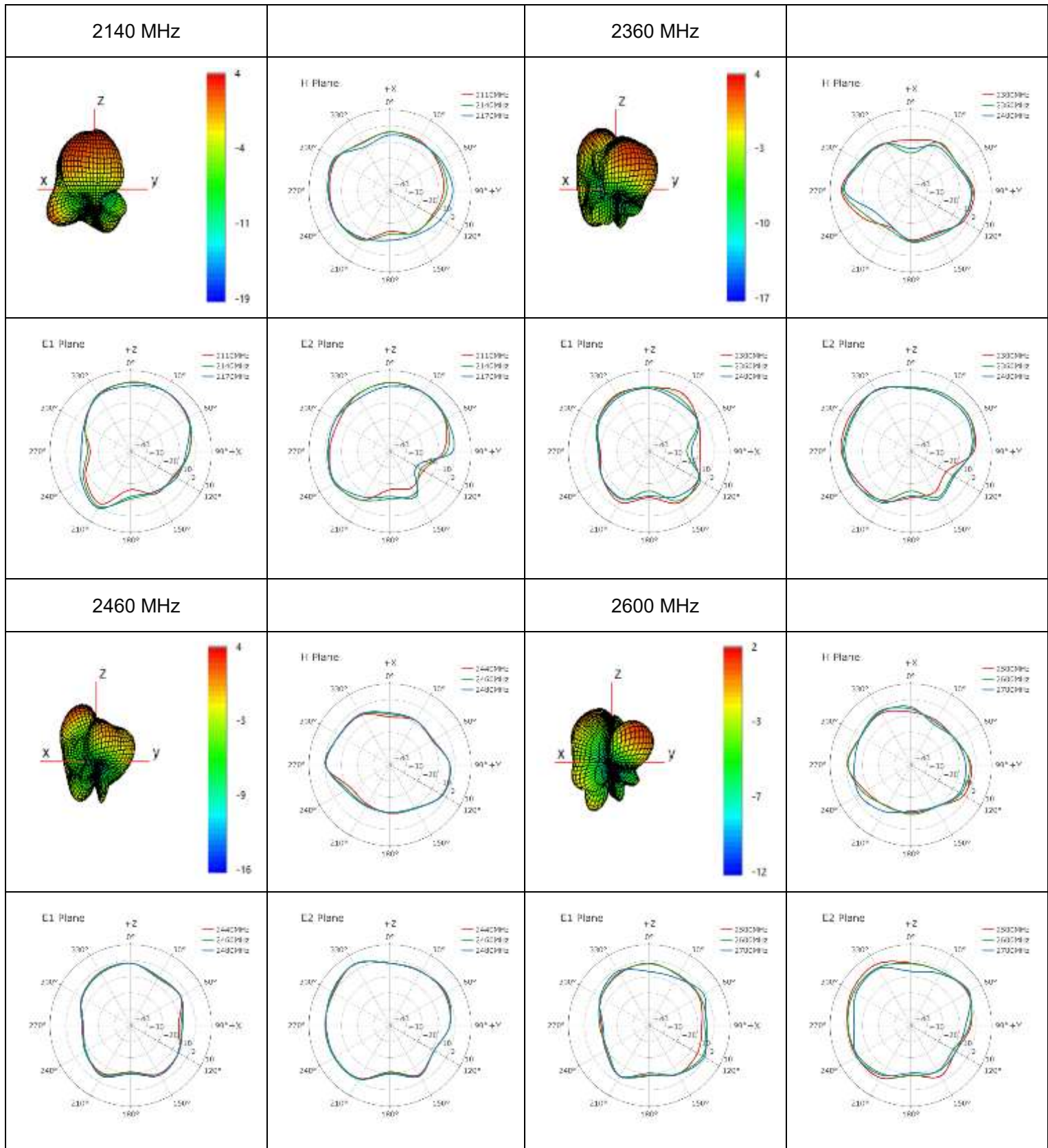
900 MHz



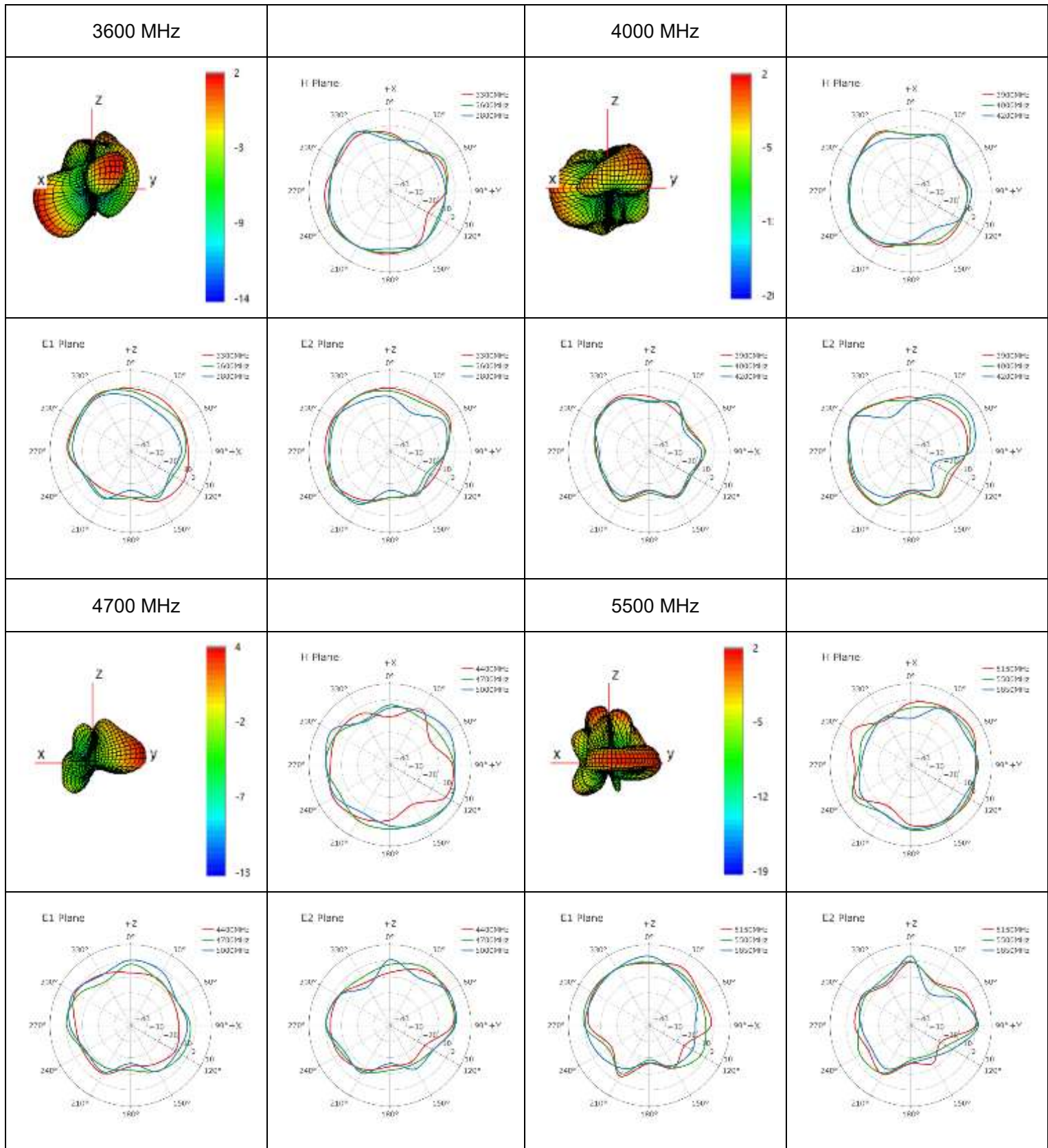
● **LMH3**



● **LMH3**

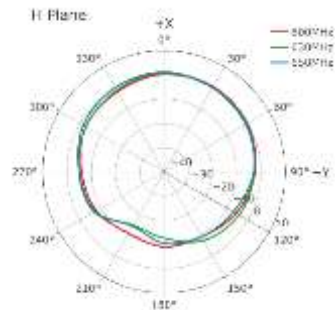
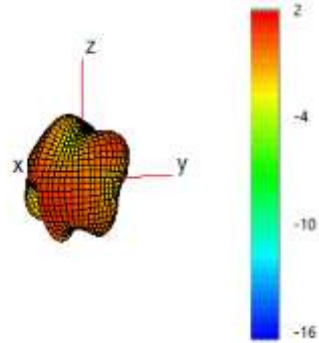


● **LMH3**

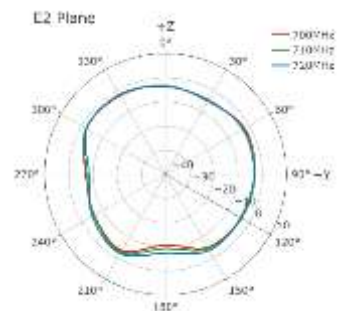
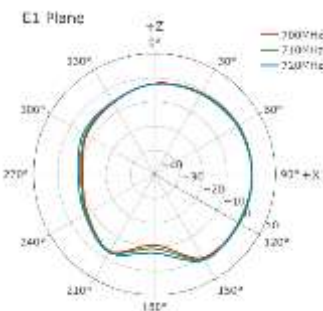
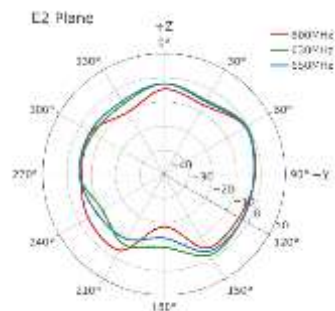
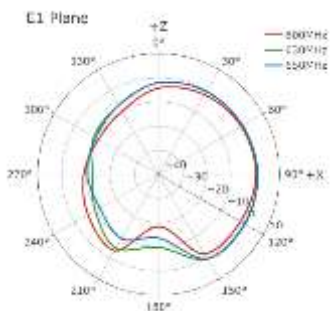
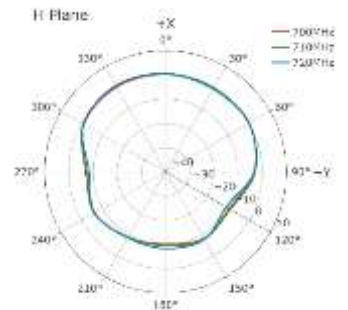
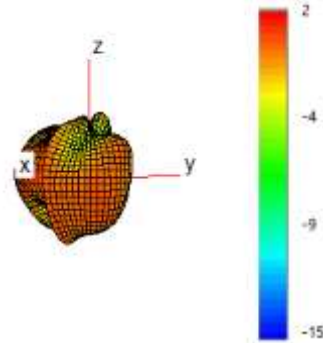


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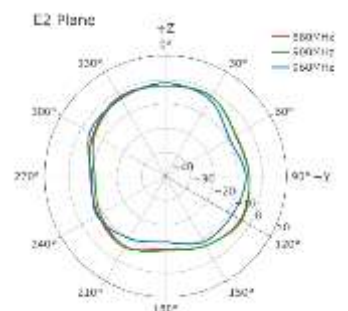
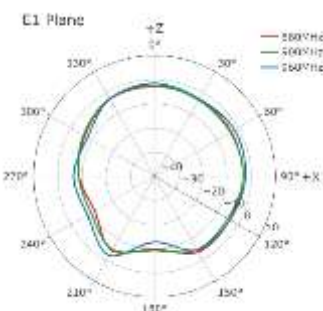
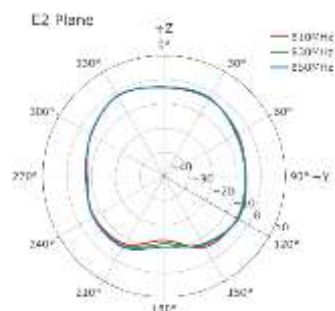
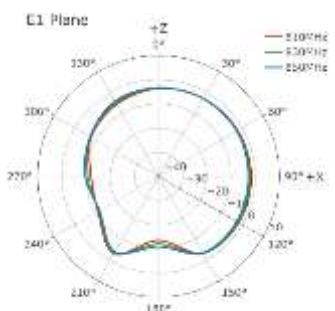
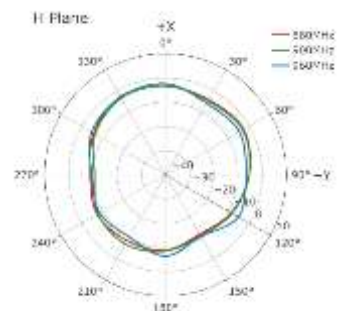
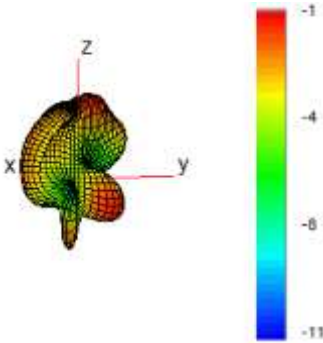
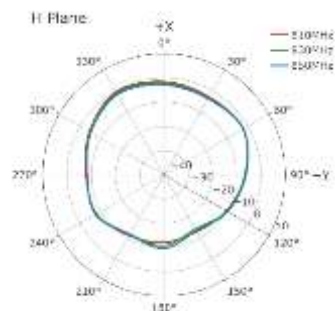
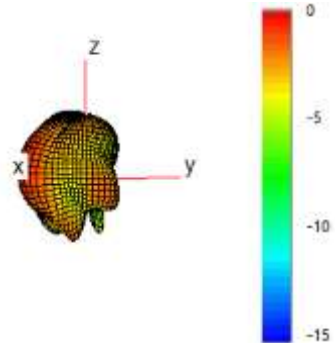
630 MHz



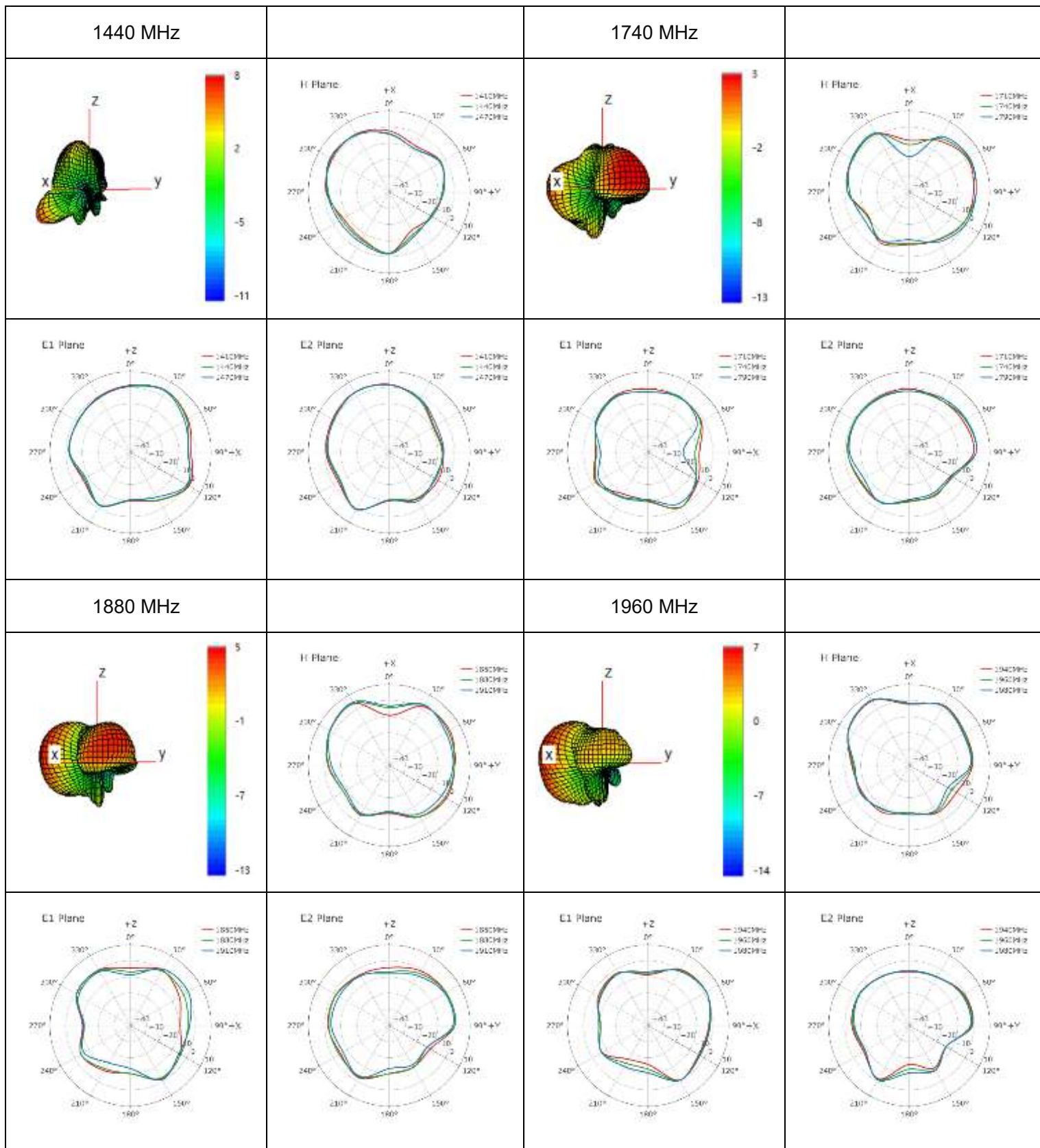
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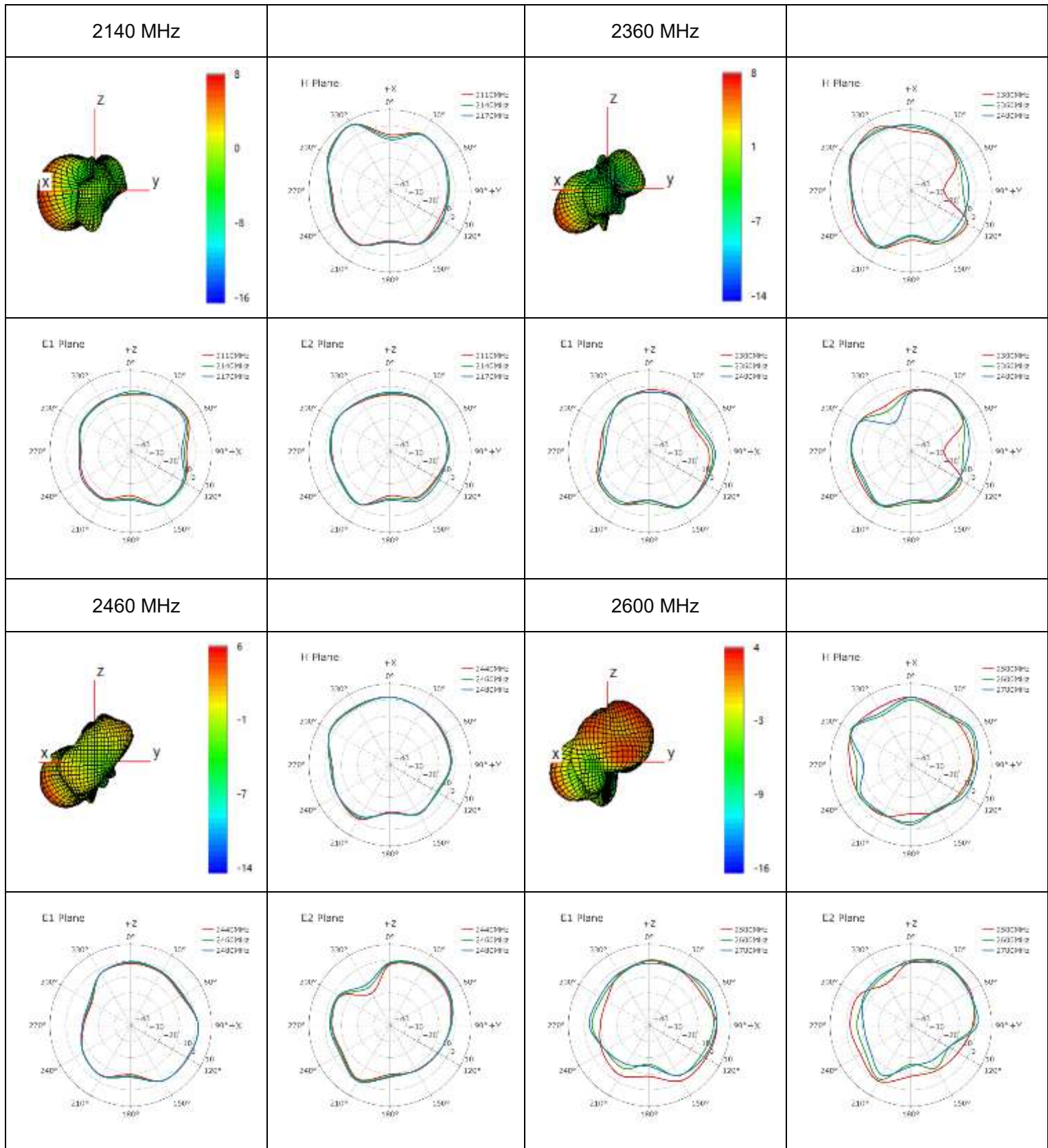
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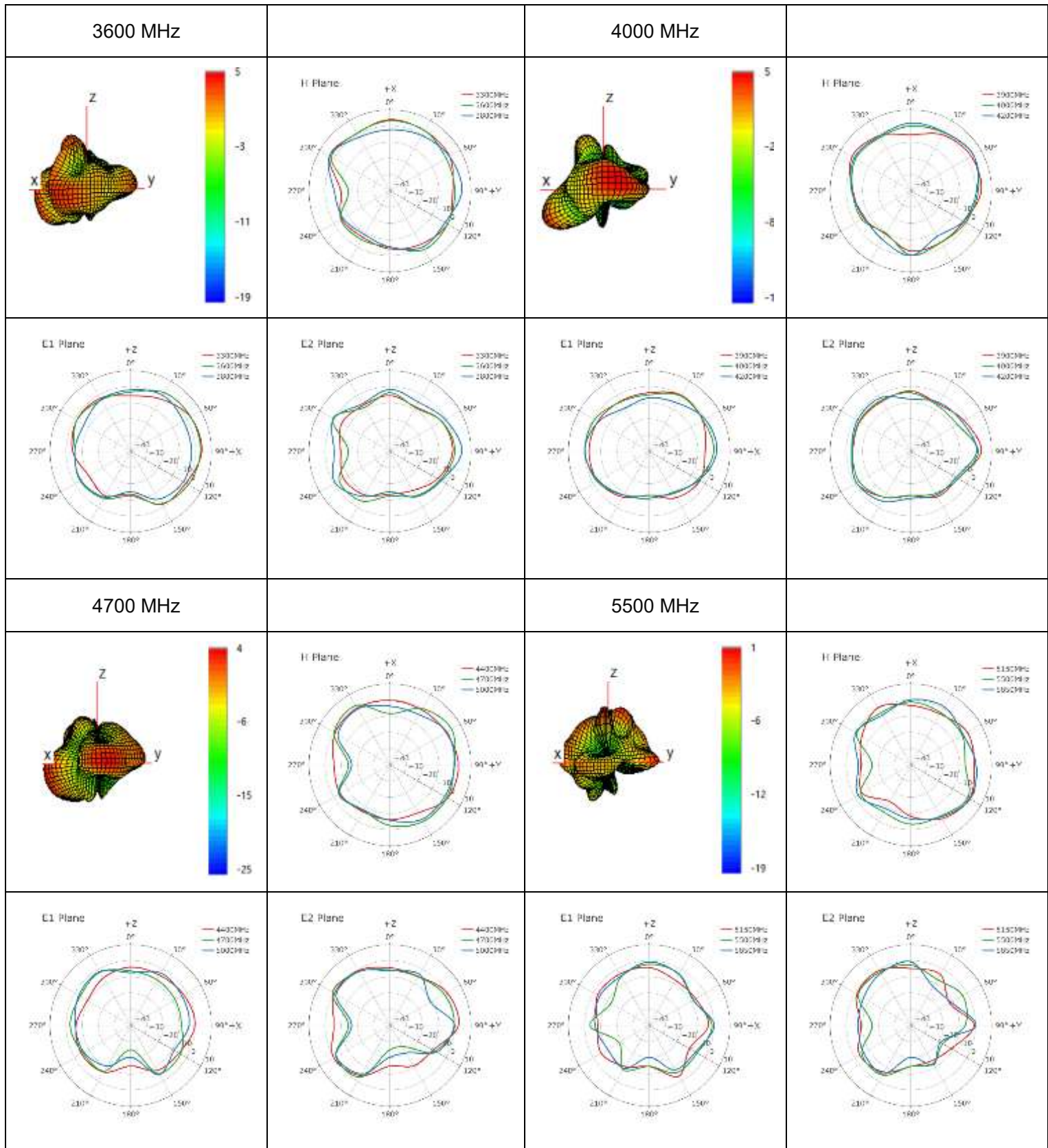
● **LMH4**



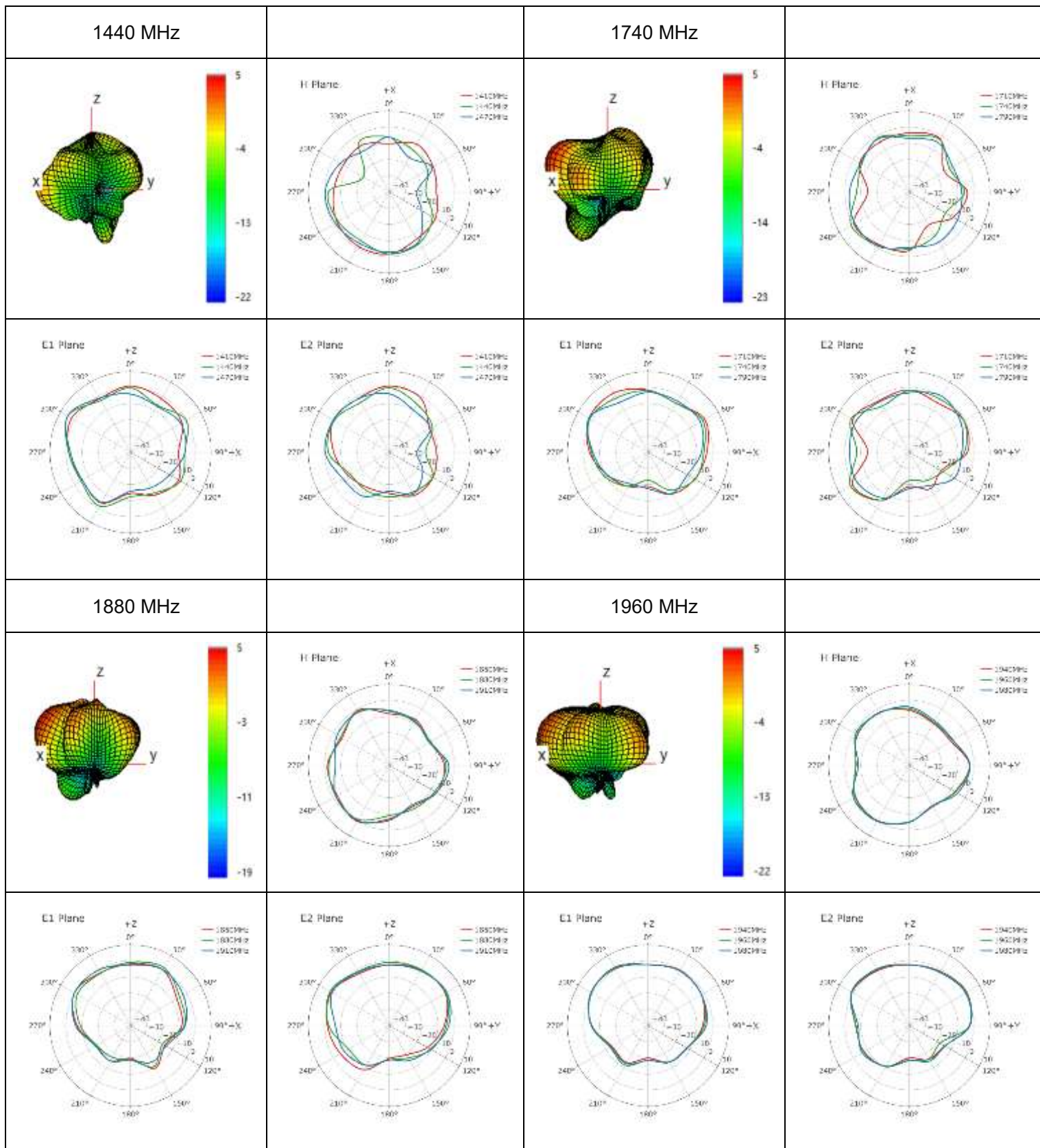
● **LMH4**



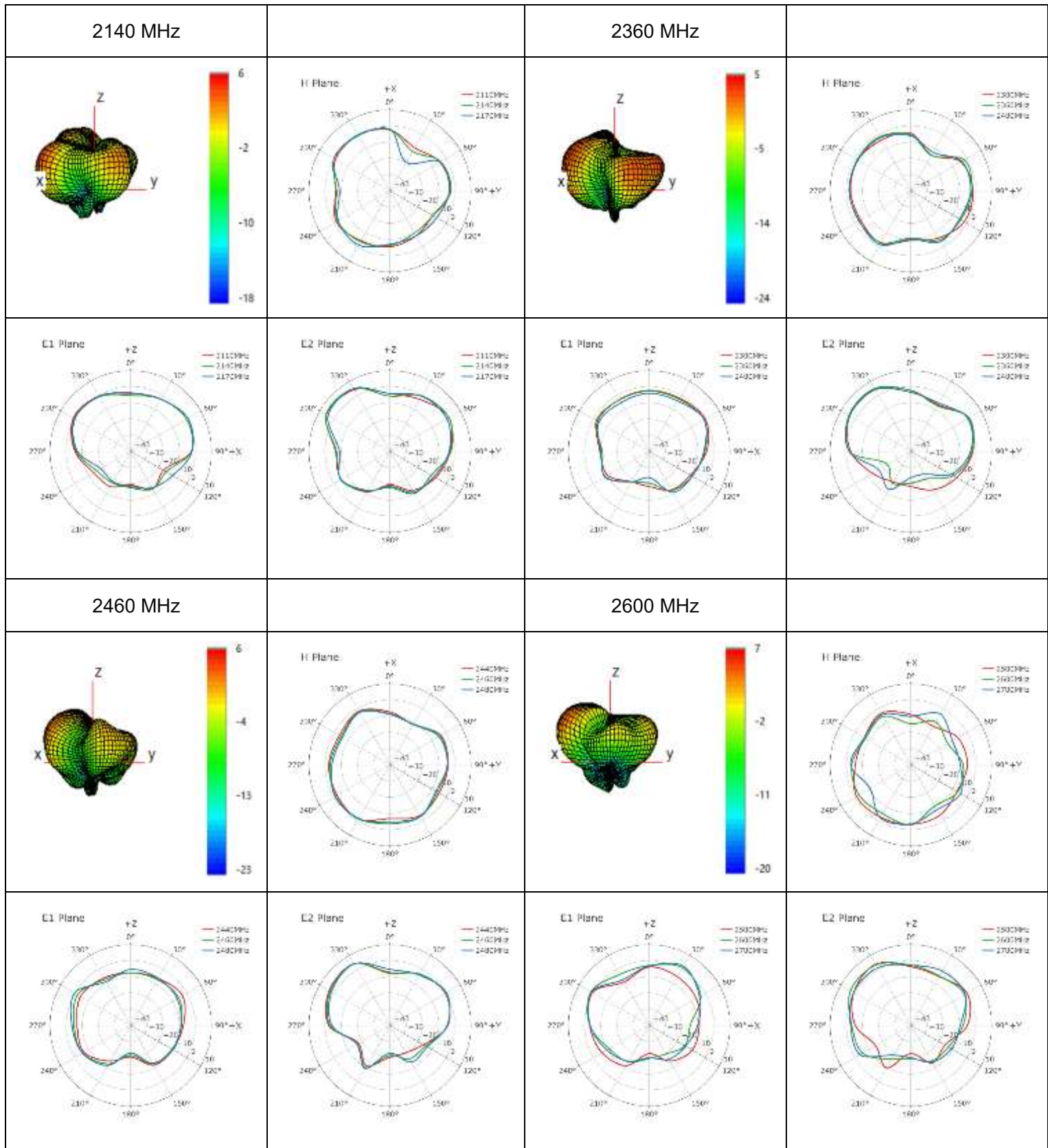
● **LMH4**



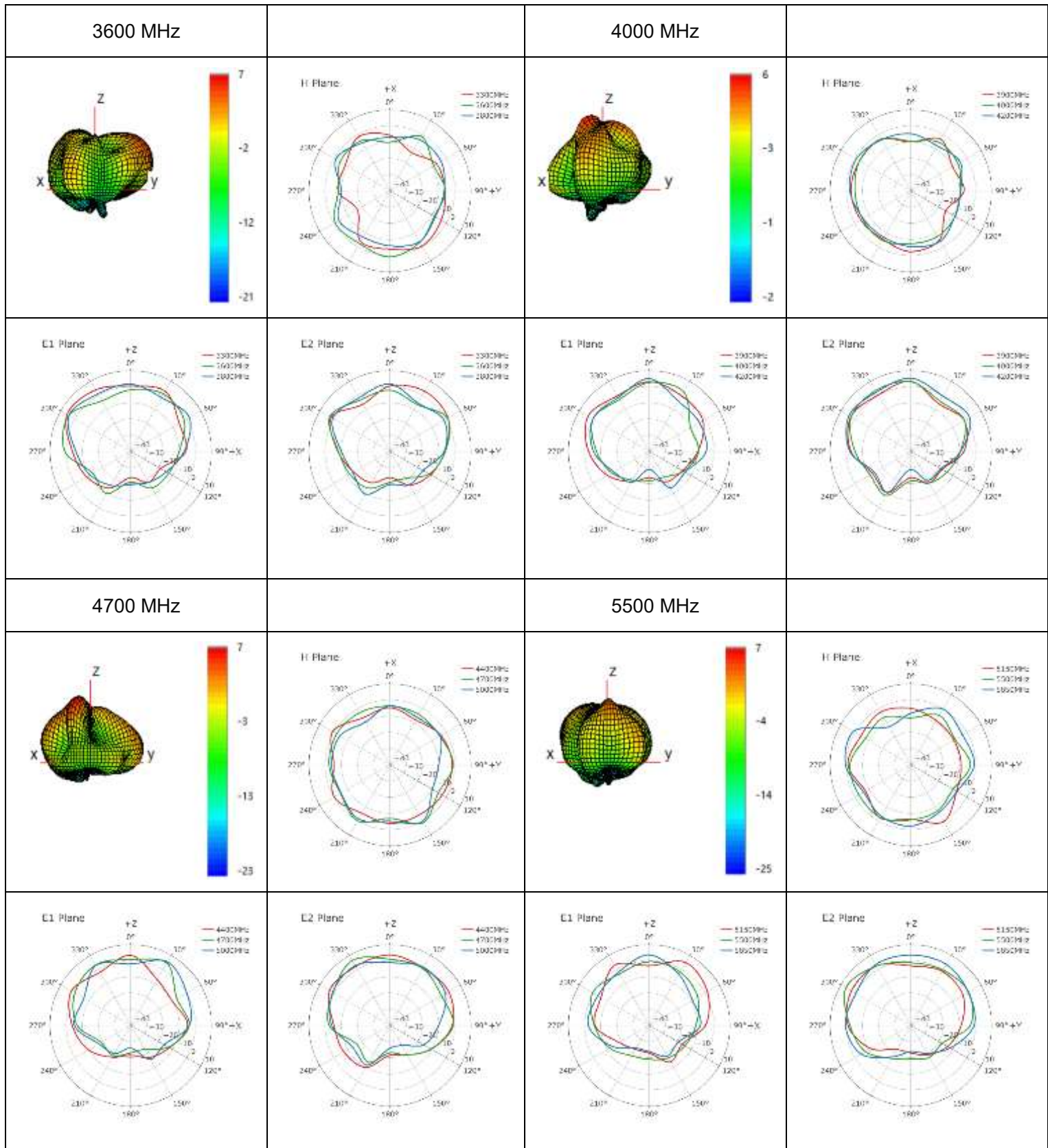
● **MH1**



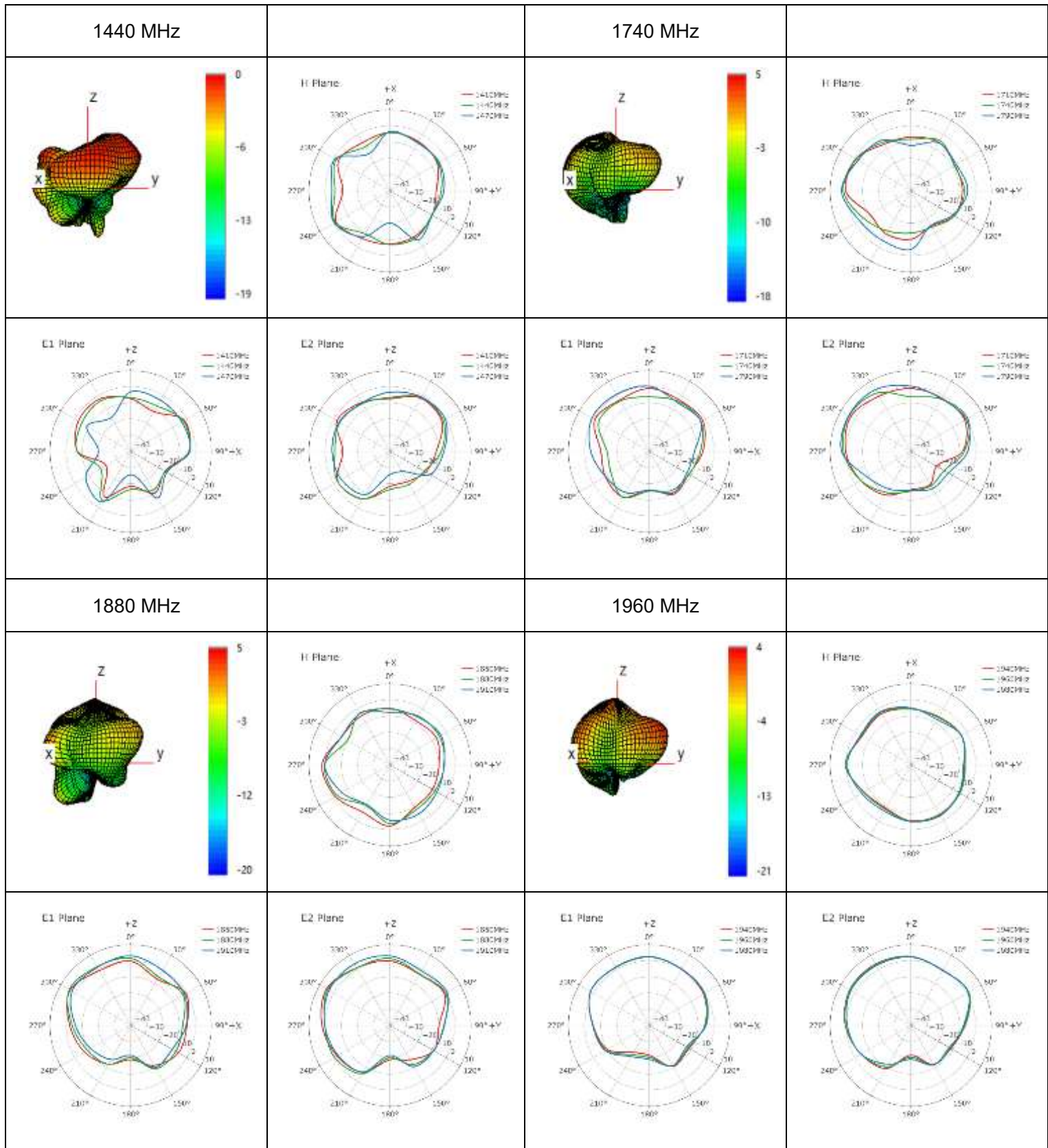
● **MH1**



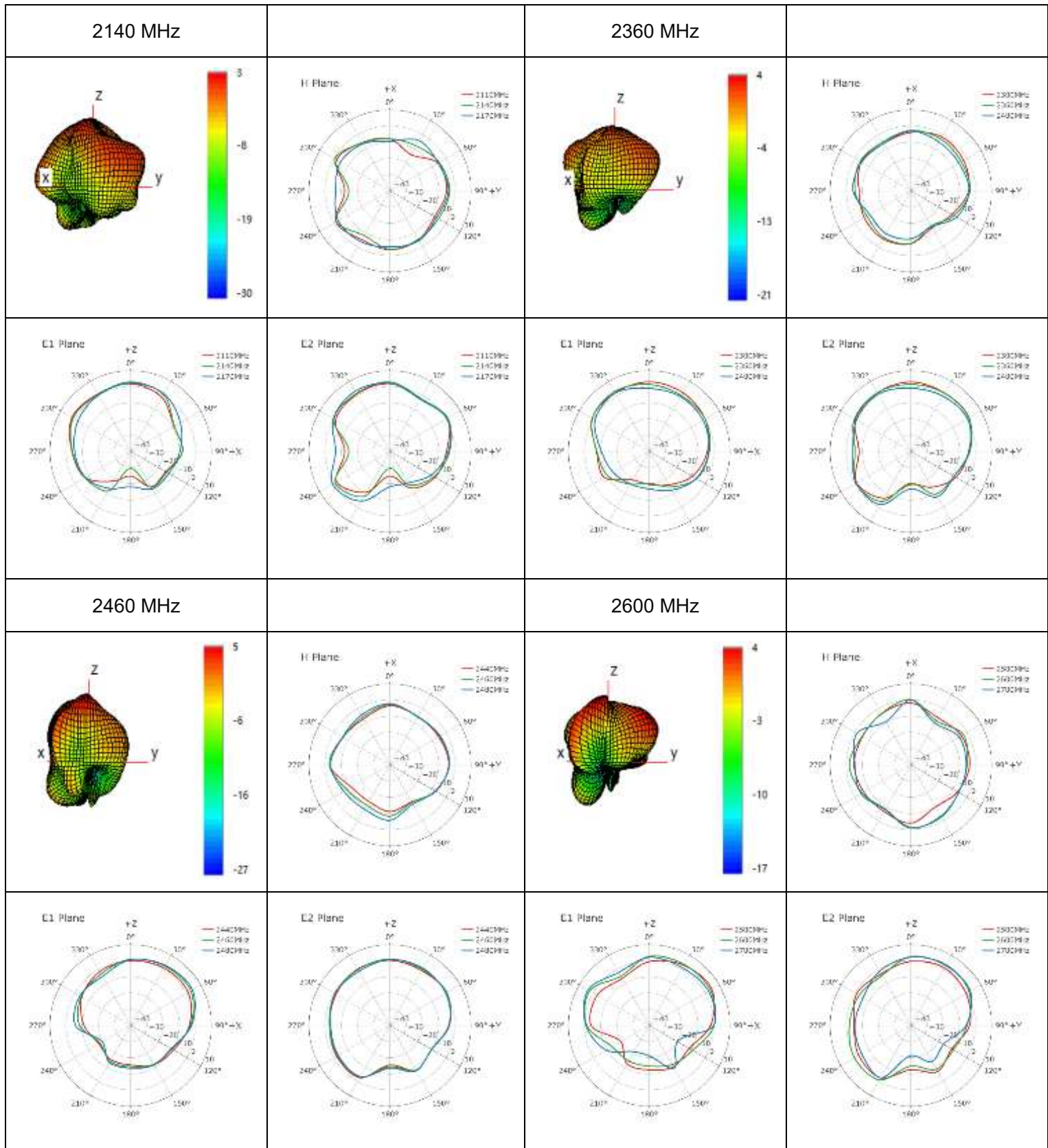
● **MH1**



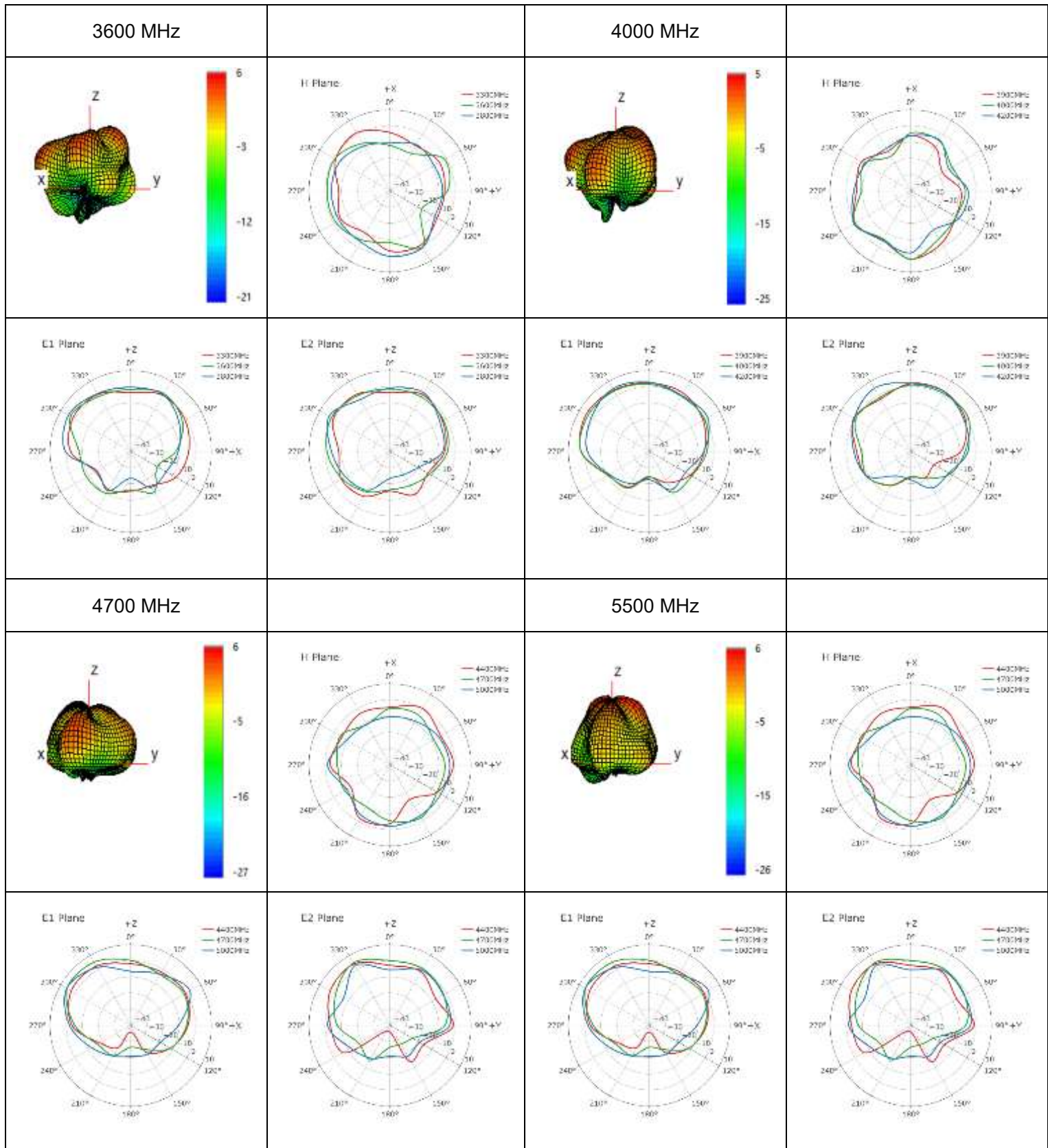
● **MH2**



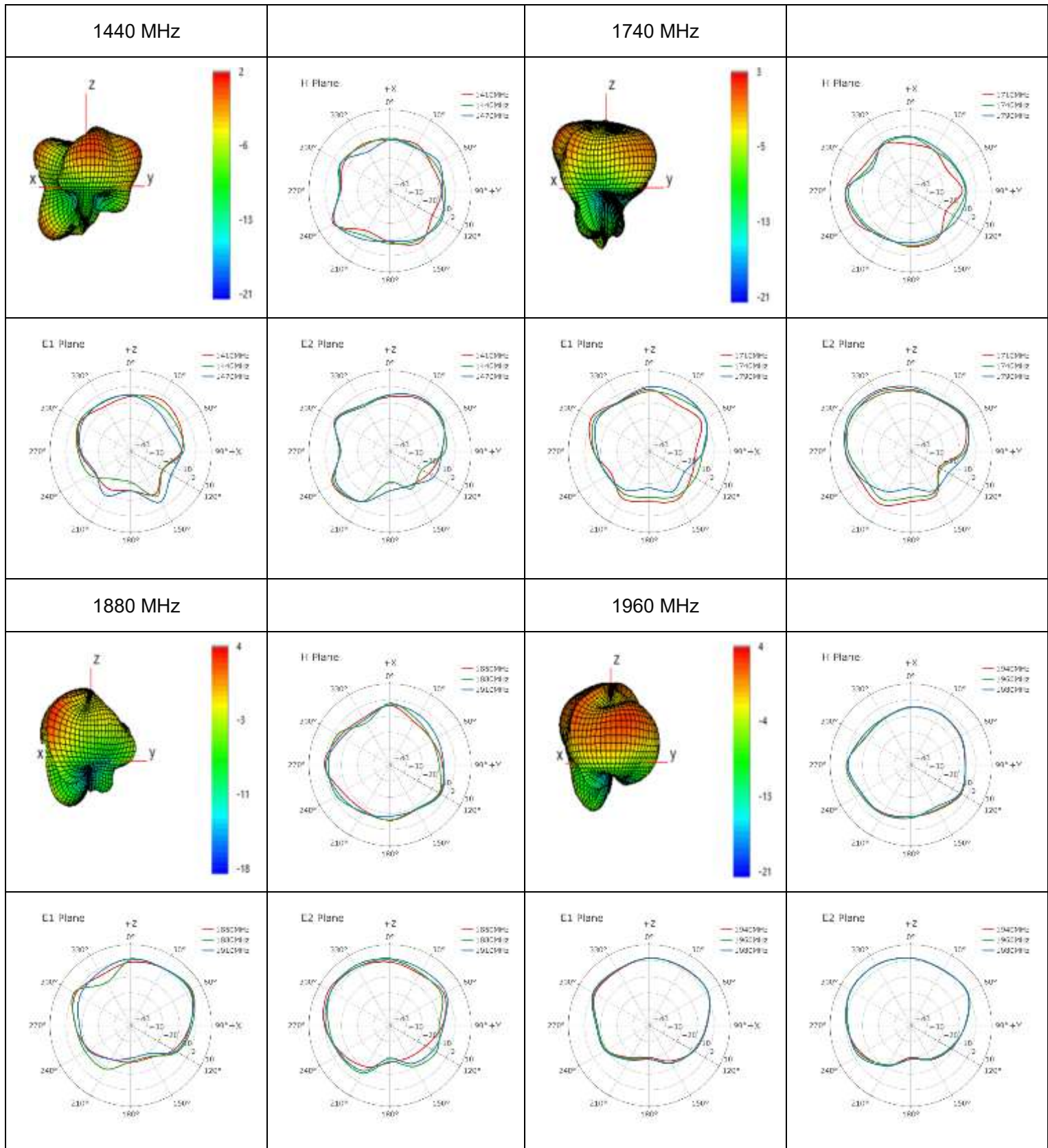
● **MH2**



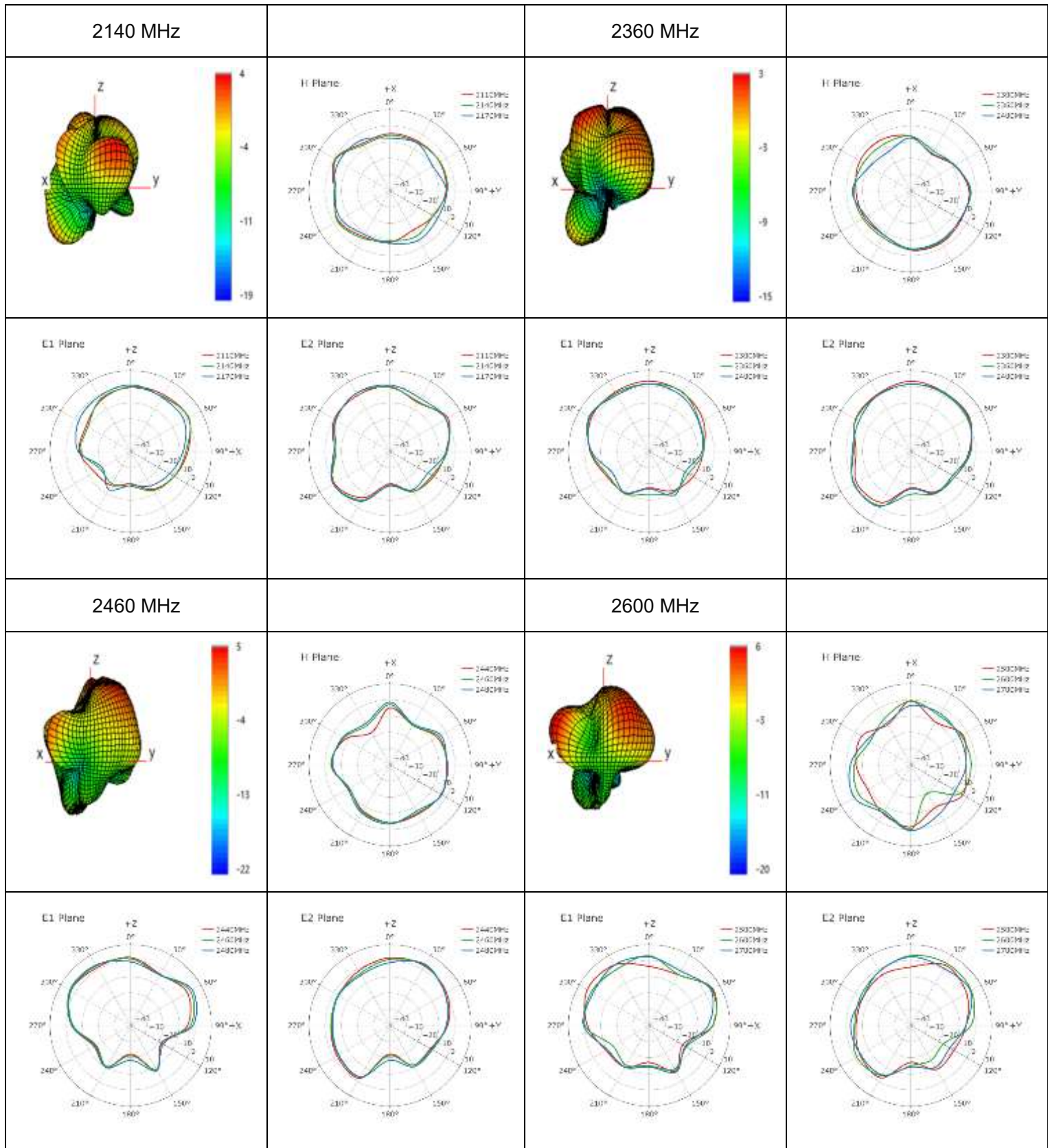
● **MH2**



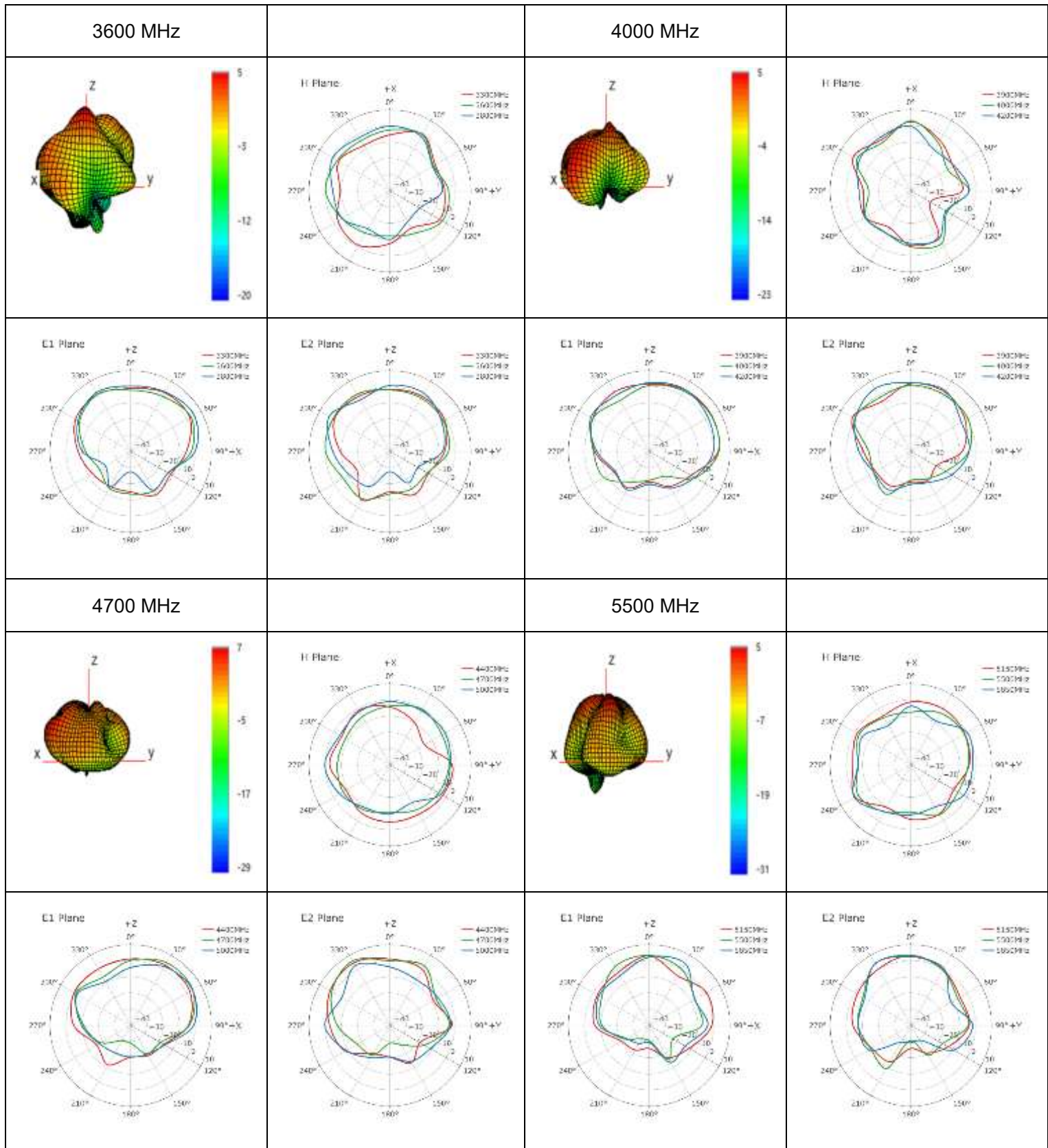
● **MH3**



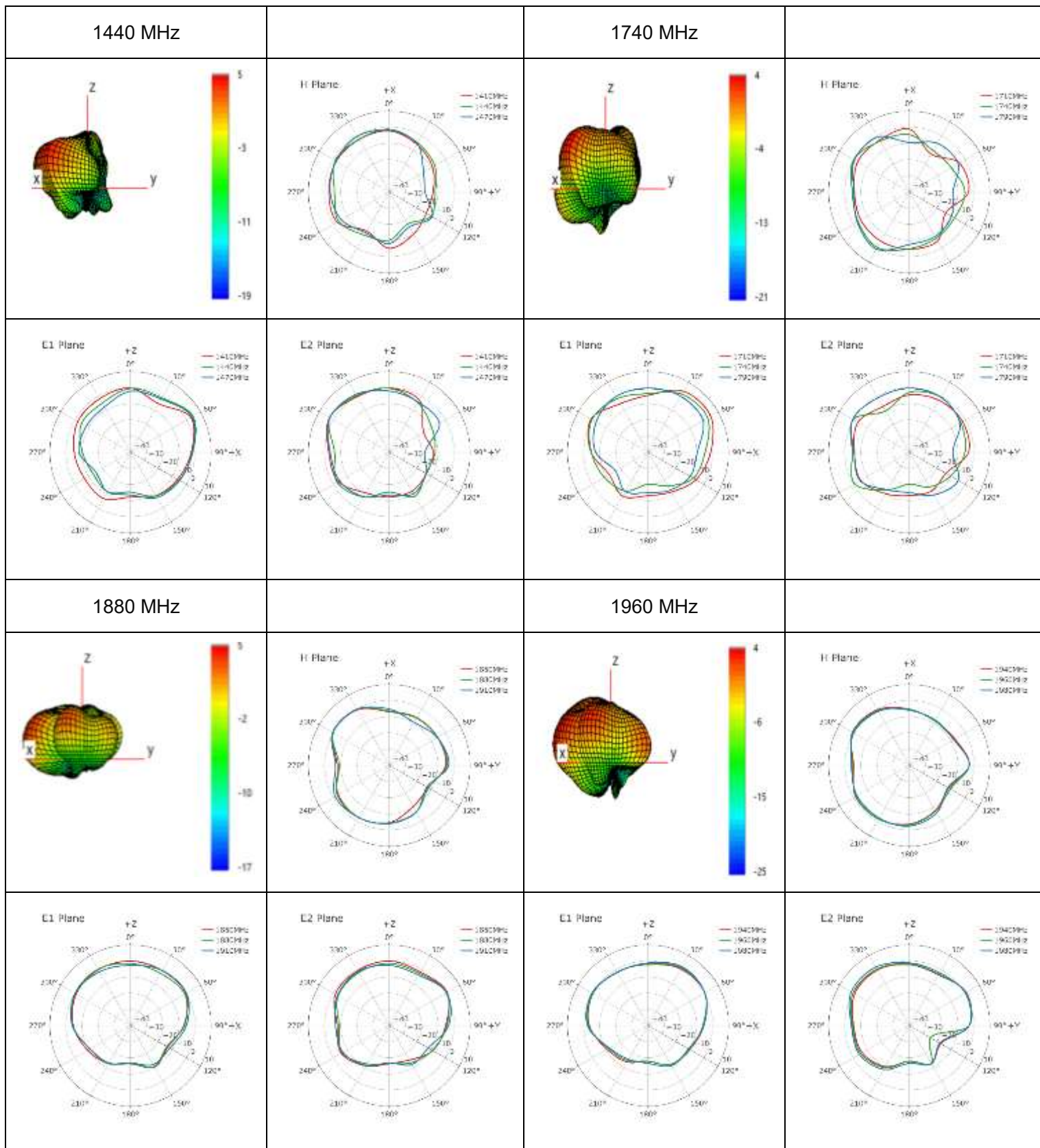
● **MH3**



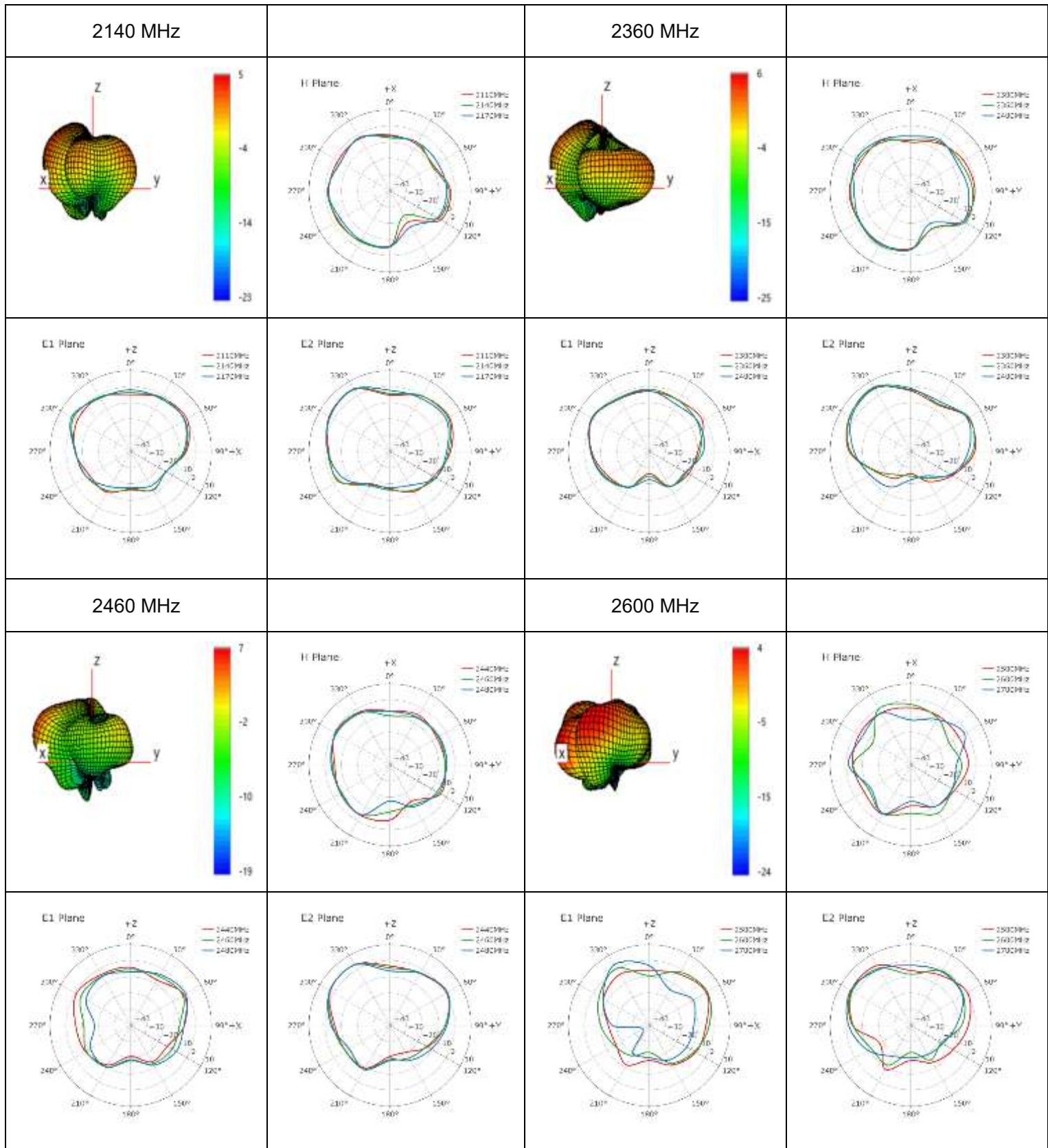
● **MH3**



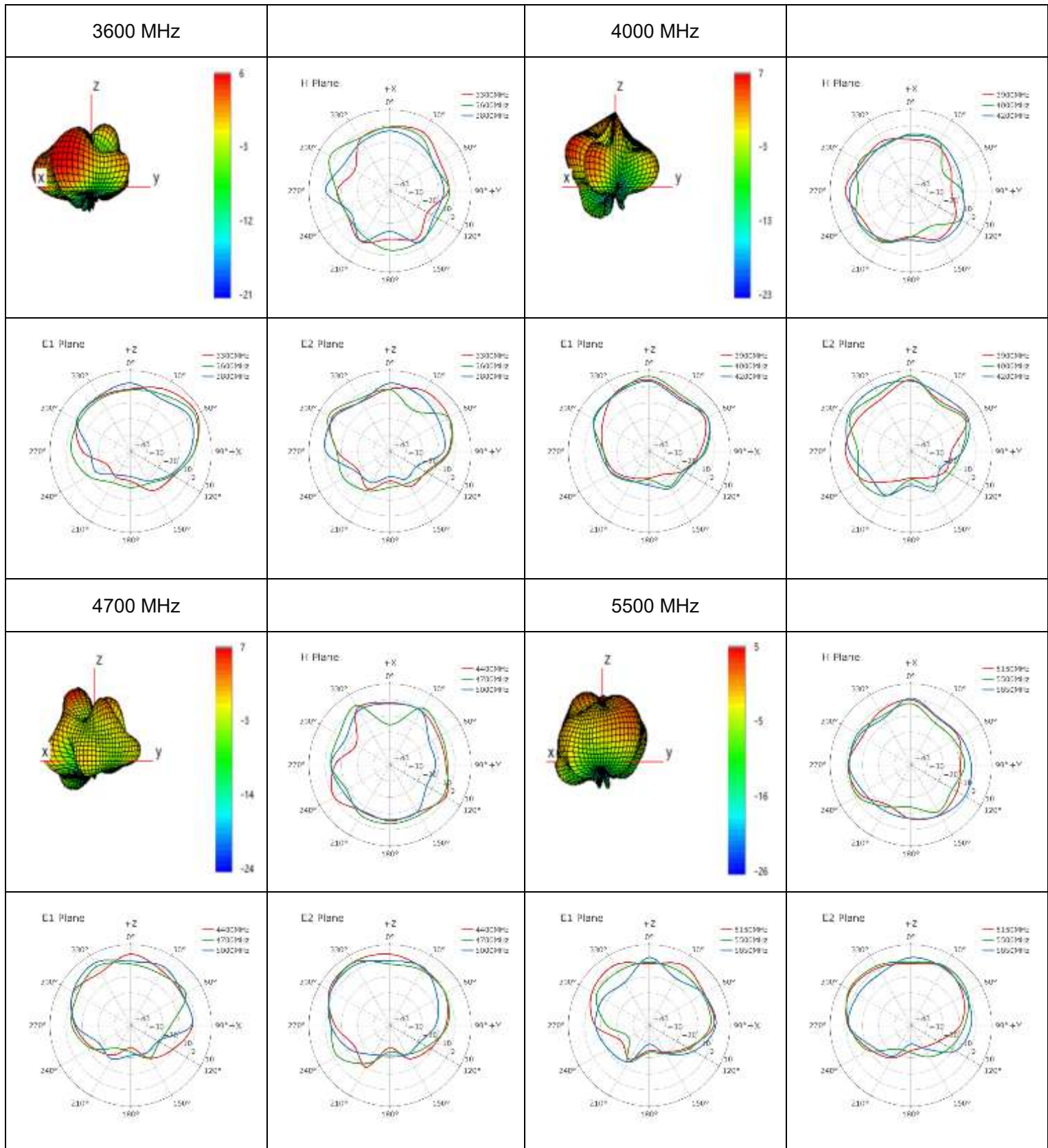
● **MH4**



● **MH4**

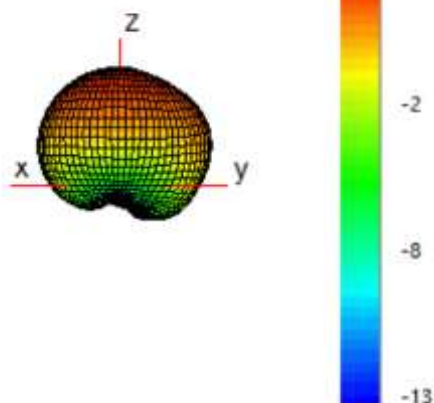


● **MH4**

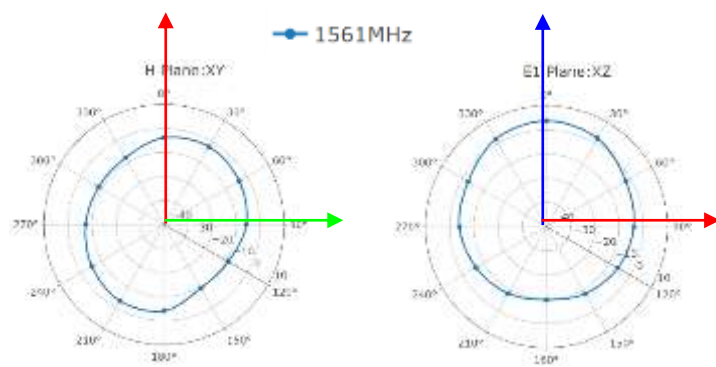
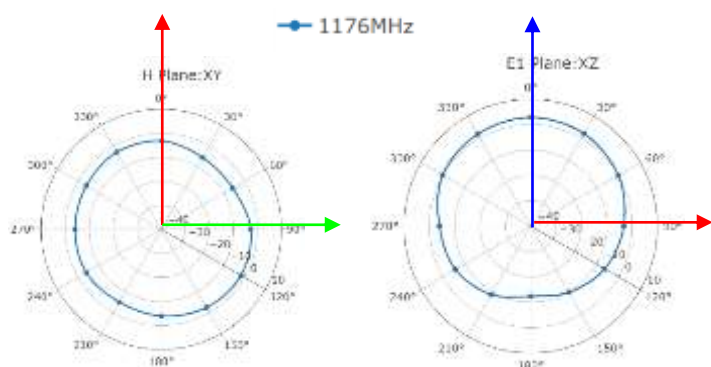
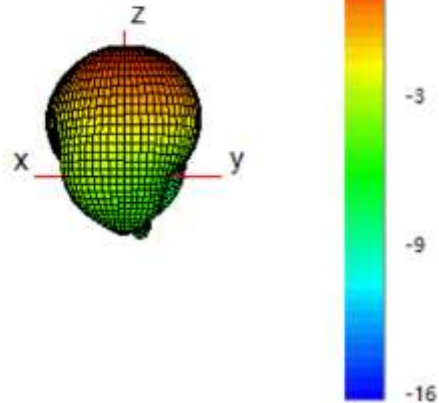


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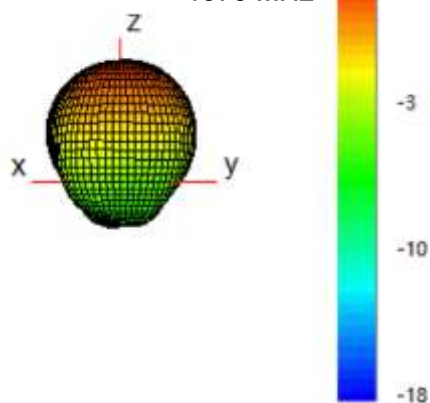
1176 MHz



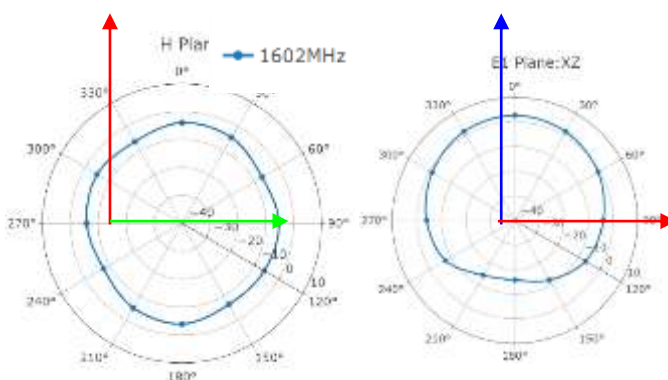
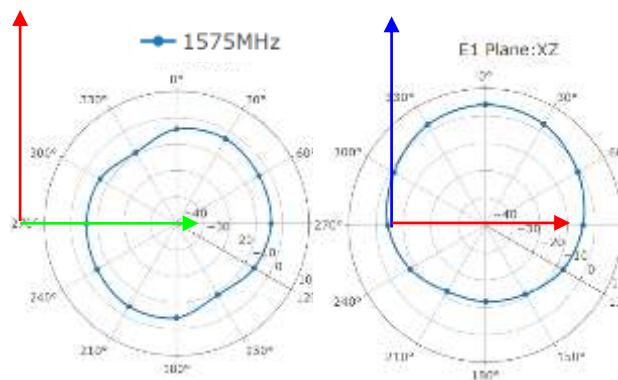
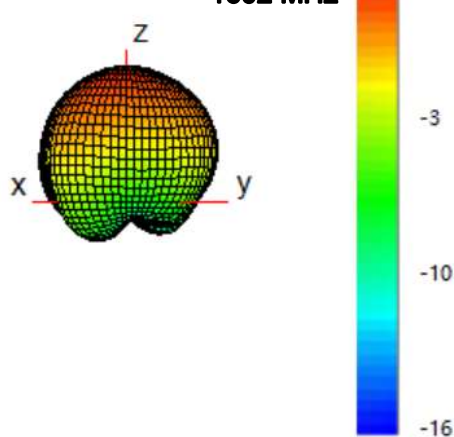
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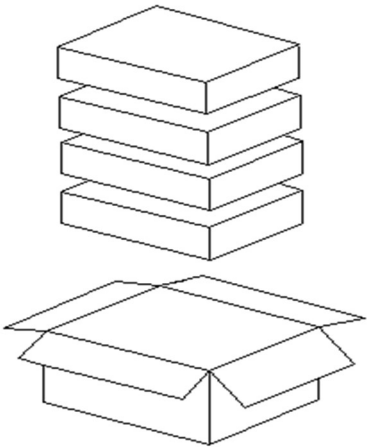
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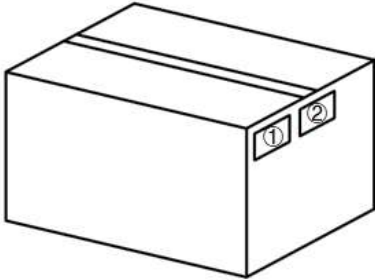
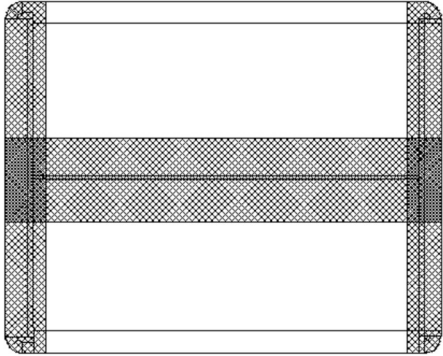


1602 MHz



4 Packaging

Step	Packaging Picture / 2D Picture	Description
1		Put the product with a bubble bag into the inner box. The bottom of the inner box is placed a bubble bag.
2		Inner Box <u>Pizza Box Size:</u> <u>L × W × H = 350 × 350 × 70 mm</u>
3		Place pizza boxes in the outer box and stack them in 4 layers. (4 pcs antennas per carton box) <u>Carton Size:</u> <u>L × W × H = 370 × 370 × 295 mm</u>

4		Position for Attaching Labels ① Carton Label ② Quality Label
5		Sealing Cartons “I” type sealing cartons

Contact Us

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Revision History

Version	Date	Author	Note
-	2023-07-21	Wilson BAO	Creation of the document
1.0	2023-07-21	Wilson BAO	First official release
2.0	2023-08-04	Andy YAN/ Junsen LI/ Steven MO/ David LIU/ Aria CHU	Updated all test data in this datasheet.



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