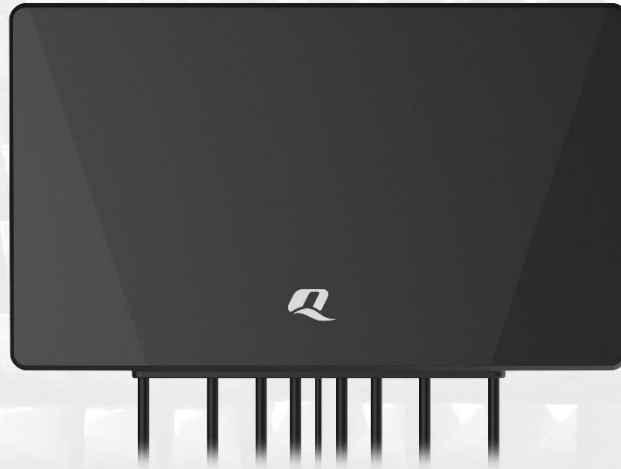




Antenna Datasheet

Product OC: YEMA013AA

Version: 2.2

Date: 2024-11-25

Status: Released

Product Name: 5G & GNSS 9in1 Adhesive Mount 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 × 30.6 mm

Mount: Adhesive/Wall/Suction

Connectors: SMA Male

IP Rating: IP67 & IP69K

Compatible with ECE-R118 cables under demand

Overview

Quectel YEMA013AA is a 5G & GNSS Adhesive mount 9in1 combo antenna optimized for 5G and 4G networks. With dimensions of 264.6 × 157.6 × 30.6 mm, the antenna can integrate a variety of antennas, such as 5G, 4G, GNSS and Wi-Fi antennas. Available with multiple mounting options including wall, adhesive and others, the antenna box supports multiple connector types and cable lengths (Compatible with ECE-R118 cables) and is designed to offer a more flexible and reliable high-performance antenna for outdoor applications.

YEMA013AA is made up of 9 antennas, with 4 × 5G LMH antennas covering 600–6000 MHz, 4 × 5G MH/Wi-Fi antennas covering 1400–6000 MHz and 1 × GNSS L1 & L5 antenna covering 1164–1189 MHz & 1559–1606 MHz. Housed in an IP67 & IP69K waterproof and IK09 impact rated case with adhesive mounting allows for easy assembly either internally or externally for Automotive and Heavy Equipment Vehicle Tracking, Remote Asset and Pipeline Monitoring and other systems. YEMA013AA can be used in harsh environments thanks to its robust UV resistant (UL 746c f1) and flame resistant (UL 94 V-0) PC enclosure.

Typical Applications Include:

- HD Video Streaming over LTE
- Vehicle Tracking and Telematic System
- IoT Applications
- Emergency Service System

Quectel provides comprehensive antenna design support such as simulation, testing and manufacturing for custom antenna solutions to meet your specific application needs. We have regional R & D centers to offer quick response to meet your requirements. Please contact our sales & FAEs if you have any requests.

Below are the variants based on YEMA013AA.

- Combo variants overview

Combo variants overview							
OC	5G LMH	5G MH/Wi-Fi	GNSS L1 & L5 (28 dB)	GNSS L1 & L5 (17 dB)	Total	Mounting Type	Screw Nut
YEMA013AA	4	4	1	-	9in1	Adhesive	-
YEMX913J1A	4	4	1	-	9in1	Wall/ Suction Cup	-
YEMA013BA	4	4	-	1	9in1	Adhesive	-
YEMA800J1AH	4	4	-	-	8in1	Adhesive	-
YEMA700J1AH	4	2	1	-	7in1	Adhesive	-
YEMA701J1BH	4	2	-	1	7in1	Adhesive	-
YEMA600J1AH	4	2	-	-	6in1	Adhesive	-
YEMA500J1AH	4	0	1	-	5in1	Adhesive	-
YEMA501J1BH	4	0	-	1	5in1	Adhesive	-
YEMA400J1AH	4	0	-	-	4in1	Adhesive	-

Contents

Overview.....	1
Contents	3
1 Specification.....	5
1.1. Electrical.....	5
1.1.1. 5G LMHs	5
1.1.2. 5G MHs	6
1.1.3. GNSS	7
1.2. Supported Bands	8
1.3. Mechanical & Environmental	12
2 Drawing	13
3 Detailed Performance	14
3.1. S-Parameter Test	14
3.1.1. VSWR.....	14
3.1.2. Return Loss	17
3.1.3. Isolation	20
3.1.3.1. Test Status: In Free Space	20
3.1.3.2. Test Status: On 500 × 500 mm Metal Plane	24
3.1.4. GNSS Axial Ratio	28
3.1.5. GNSS LNA Gain.....	29
3.1.6. GNSS Noise Figure.....	30
3.2. Radiation Performance Test.....	31
3.2.1. Efficiency	31
3.2.2. Average Gain	34
3.2.3. Peak Gain.....	37
3.2.4. ECC	40
3.2.4.1. Test Status: In Free Space	40
3.2.4.2. Test Status: On 500 × 500 mm Metal Plane	44
3.2.5. 3D & 2D Radiation Pattern.....	48
3.2.5.1. Test Condition: In Free Space	48
3.2.5.2. Test Condition: On 500 ×500 mm Metal Plane	78
4 Packaging	108
5 Installation	110
6 Appendix Reference	112
Contact Us.....	114

Legal Notices 115

Revision History 117

1 Specification

- **Test Condition:** In Free Space and On 500 × 500 mm Metal Plane

1.1. Electrical

Electrical Specifications		
Frequency Range	5G LMHs	600–960 MHz, 1400–6000 MHz
	5G MHs	1400–6000 MHz
	GNSS	1164–1189 MHz, 1559–1606 MHz
Radiation Pattern	5G LMHs & 5G MHs	Omni-directional
	GNSS	Directional
Polarization	5G LMHs & 5G MHs	Linear
	GNSS	RHCP
Impedance		50 Ω
Isolation		≤ -7.0 dB
Axial Ratio (GNSS)		< 3 dB

1.1.1. 5G 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										

- 5G LMHs: LMH1, LMH2, LMH3, LMH4 Antennas
- 5G MHs: MH1, MH2, MH3, MH4 Antennas
- FS: In Free Space
- MP: On 500 × 500 mm Metal Plane

1.1.2. 5G 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	-	-	-	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

- 5G LMHs: LMH1, LMH2, LMH3, LMH4 Antennas
- 5G 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		

- 5G LMHs: LMH1, LMH2, LMH3, LMH4 Antennas
- 5G 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

- 5G LMHs: LMH1, LMH2, LMH3, LMH4 Antennas
- 5G MHs: MH1, MH2, MH3, MH4 Antennas
- FS: In Free Space
- MP: On 500 × 500 mm Metal Plane

1.2. Supported Bands

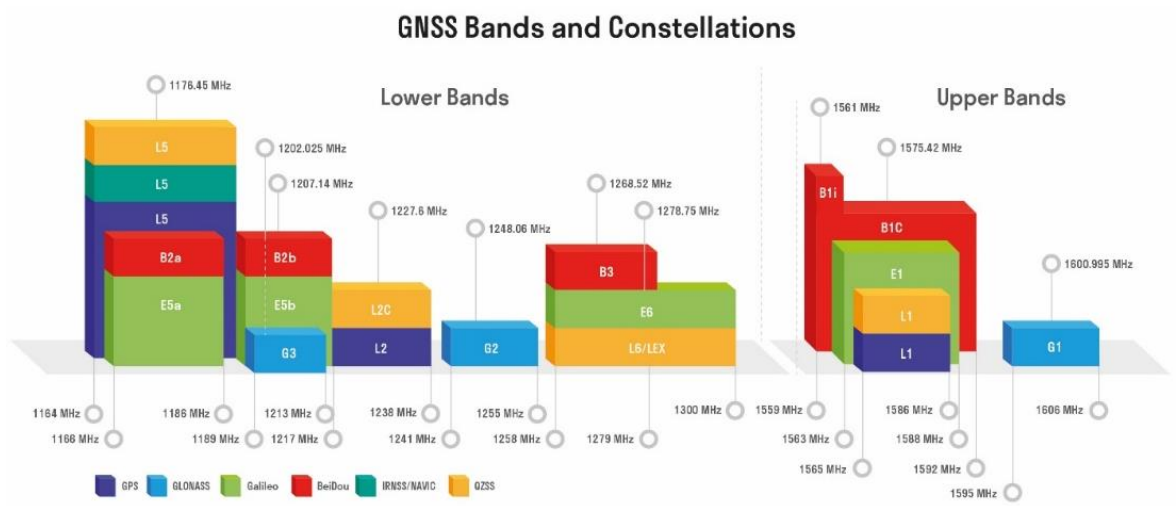
5G NR/ LTE/ LTE-Advanced/ WCDMA/ HSPA/ HSPA+/ GPRS/ GSM/ NB-IoT					
Band	Frequency (MHz)	Uplink (MHz)	Downlink (MHz)	LMHs	MHs
1	2100	1920–1980	2110–2170	√	√
2	1900	1850–1910	1930–1990	√	√
3	1800	1710–1785	1805–1880	√	√
4	1700	1710–1755	2110–2155	√	√
5	850	824–849	869–894	√	-
7	2600	2500–2570	2620–2690	√	√
8	900	880–915	925–960	√	-

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

5G NR/ LTE/ LTE-Advanced/ WCDMA/ HSPA/ HSPA+/ GPRS/ GSM/ NB-IoT					
Band	Frequency (MHz)	Uplink (MHz)	Downlink (MHz)	LMHs	MHs
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		√	√
Note: Covered √ means efficiency > 20%					

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

IRNSS	L5 Centre 1176.45 (1164–1189)				
	√				

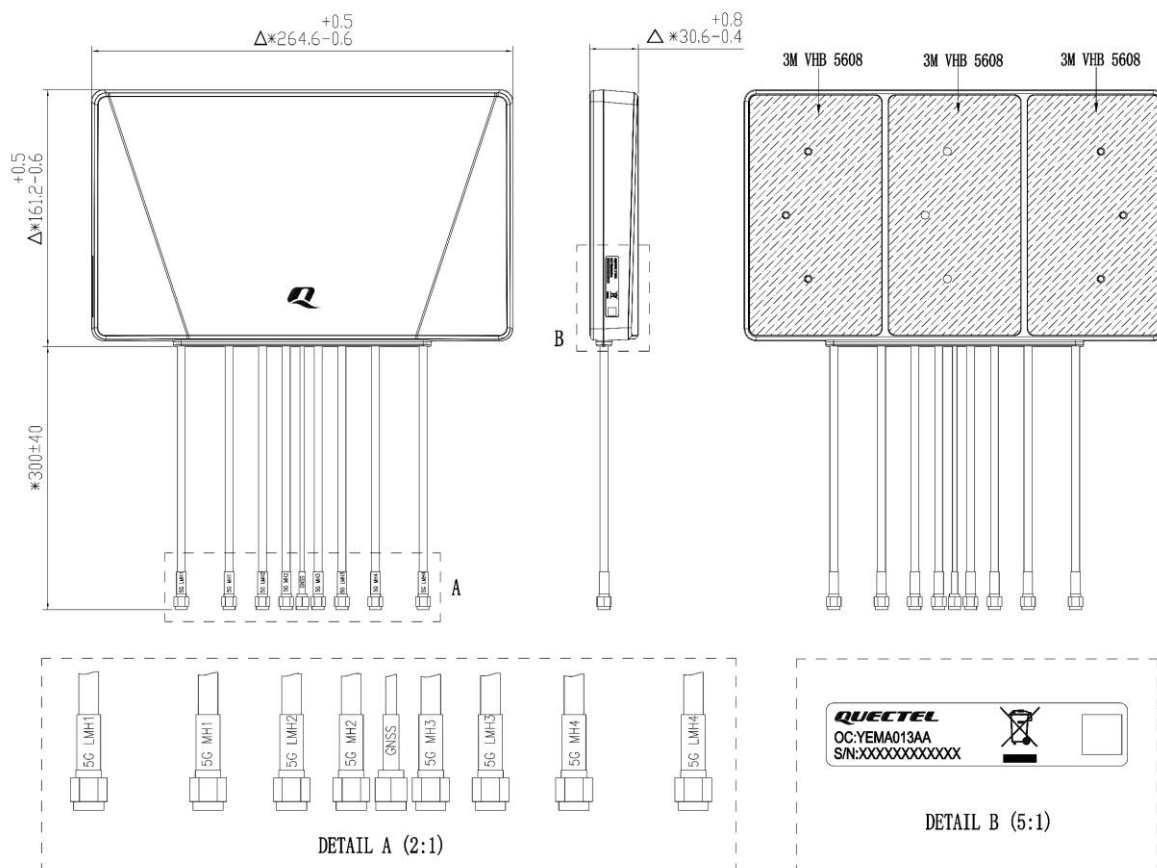


1.3. Mechanical & Environmental

Mechanical		
Antenna Size		264.6 × 161.2 × 30.6 mm
Casing Material & Color		PC & Black
Cable Type & Length	5G LMHs & 5G MHs	ALSR200 Black & 300 mm
	GNSS	RG174 Black & 300 mm
Weight		837g
Connector Type		SMA Male (The current state of the SMA connector is not waterproof. If a waterproof connector is required, it can be customized, such as a waterproof FAKRA connector.)
Mounting Type		Adhesive
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

- 5G LMHs: LMH1, LMH2, LMH3, LMH4 Antennas
- 5G MHs: MH1, MH2, MH3, MH4 Antennas
- FS: In Free Space
- MP: On 500 × 500 mm Metal Plane

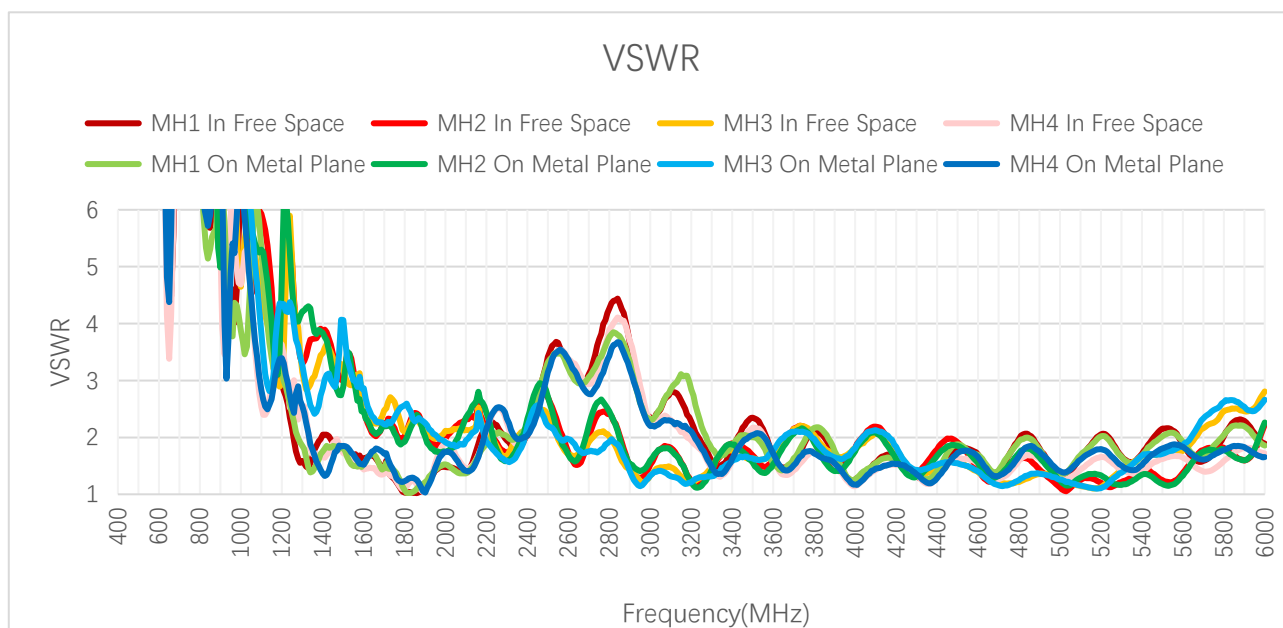
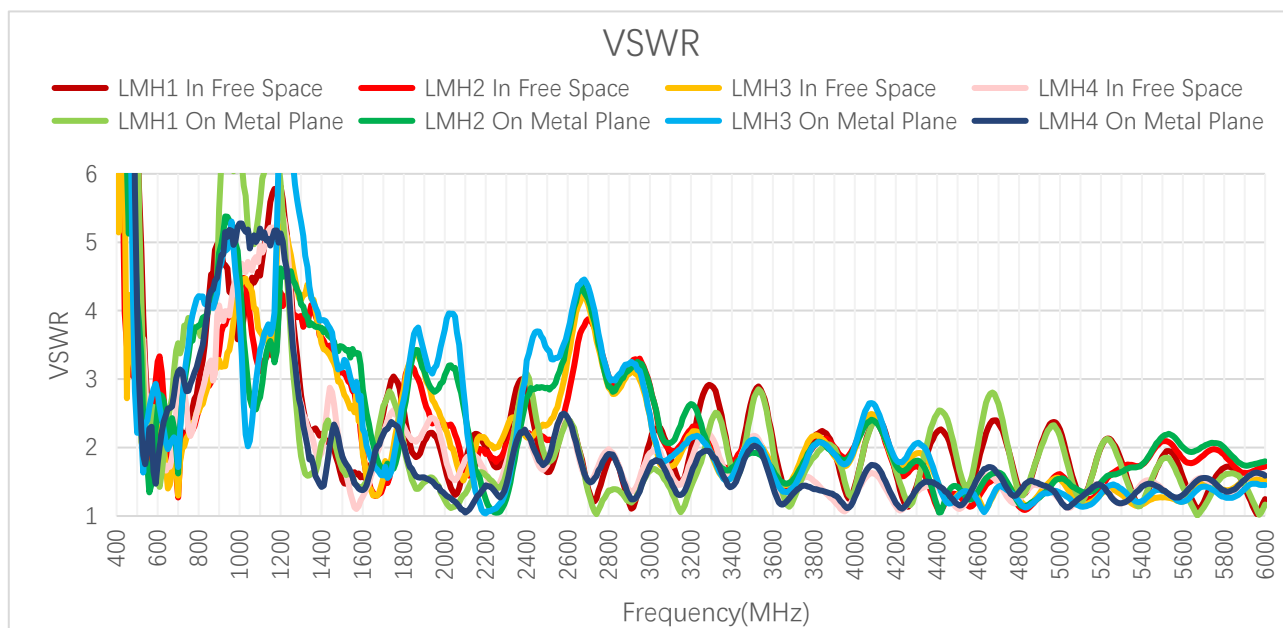
2 Drawing

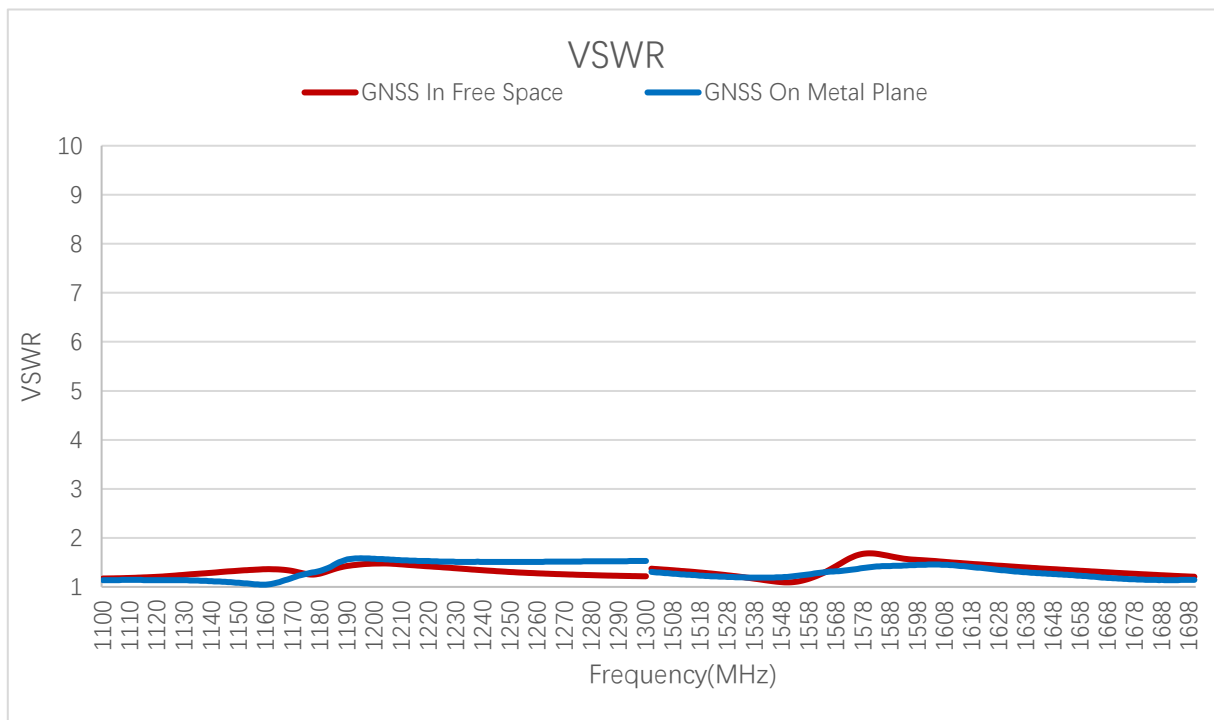


3 Detailed Performance

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	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

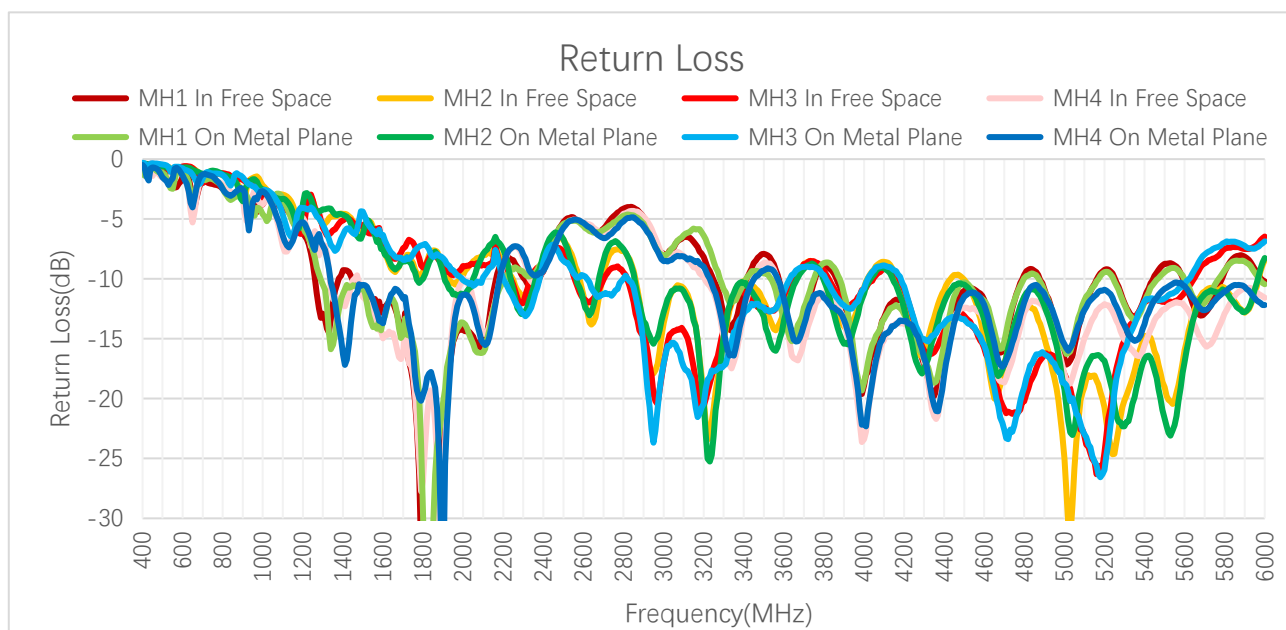
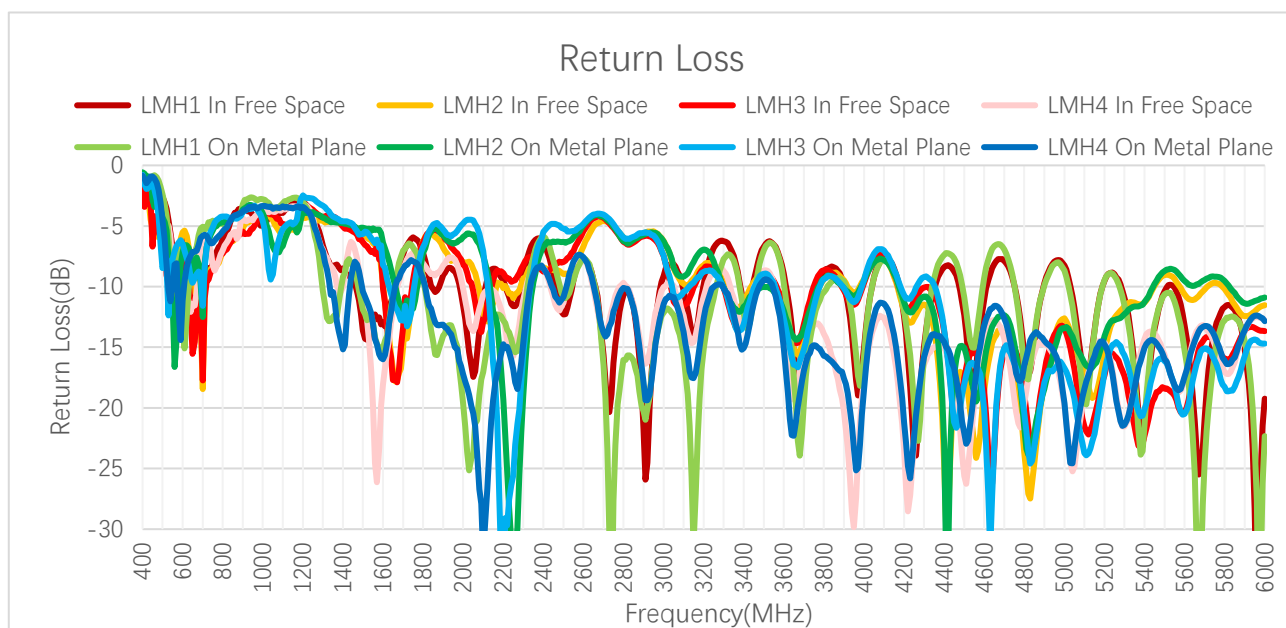
VSWR – MH

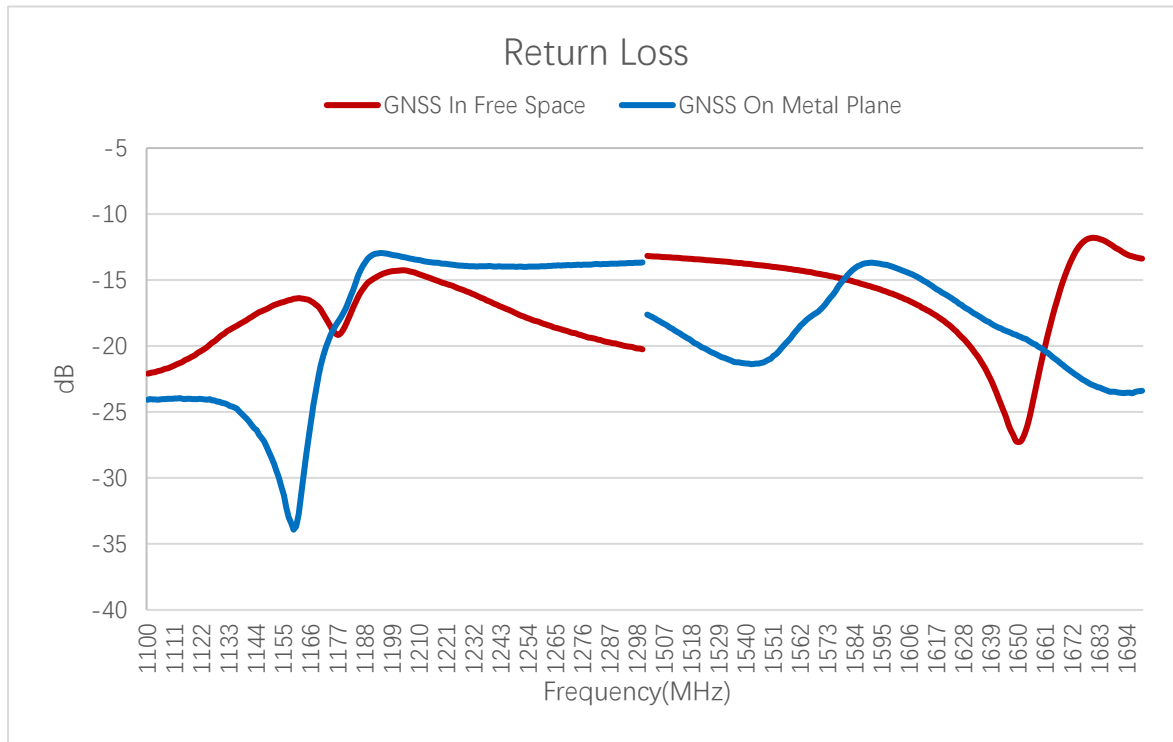
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	2.0	1.6	1.3	1.0
	MP	-	-	-	-	-	-	1.8	1.6	1.4	1.2
MH2	FS	-	-	-	-	-	-	3.6	2.2	2.2	2.3
	MP	-	-	-	-	-	-	3.3	2.2	2.2	2.2
MH3	FS	-	-	-	-	-	-	3.5	2.5	2.7	2.2
	MP	-	-	-	-	-	-	3.0	2.2	2.3	2.3
MH4	FS	-	-	-	-	-	-	1.8	1.5	1.3	1.1
	MP	-	-	-	-	-	-	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

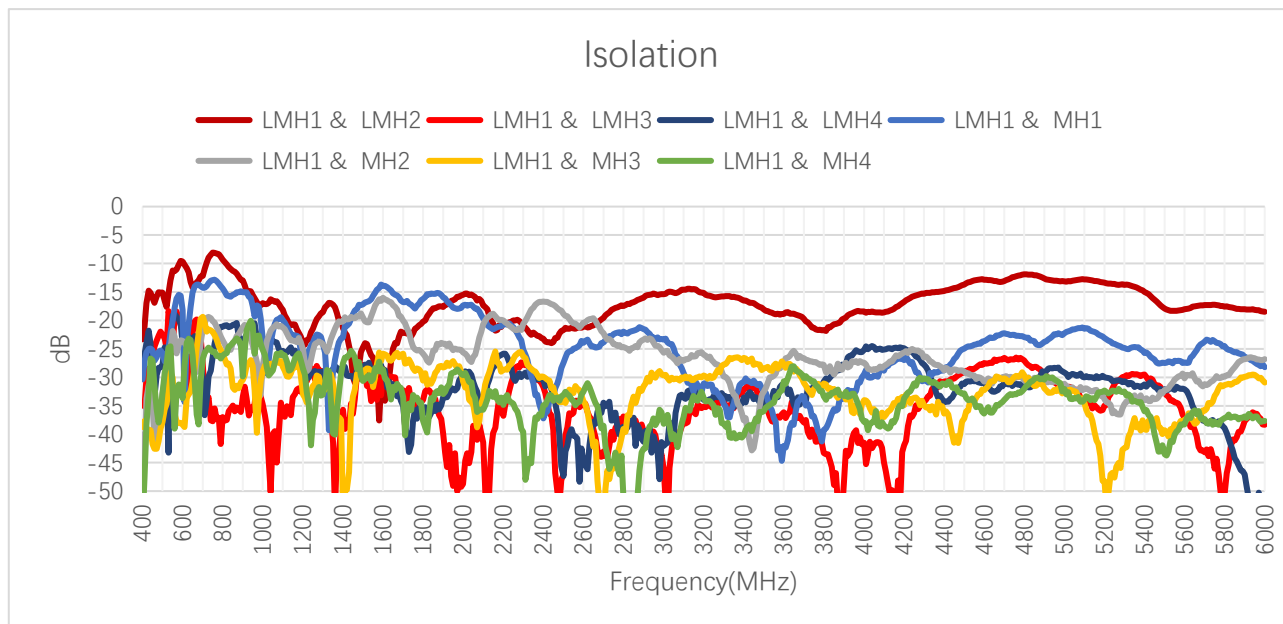
Return Loss (dB)

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

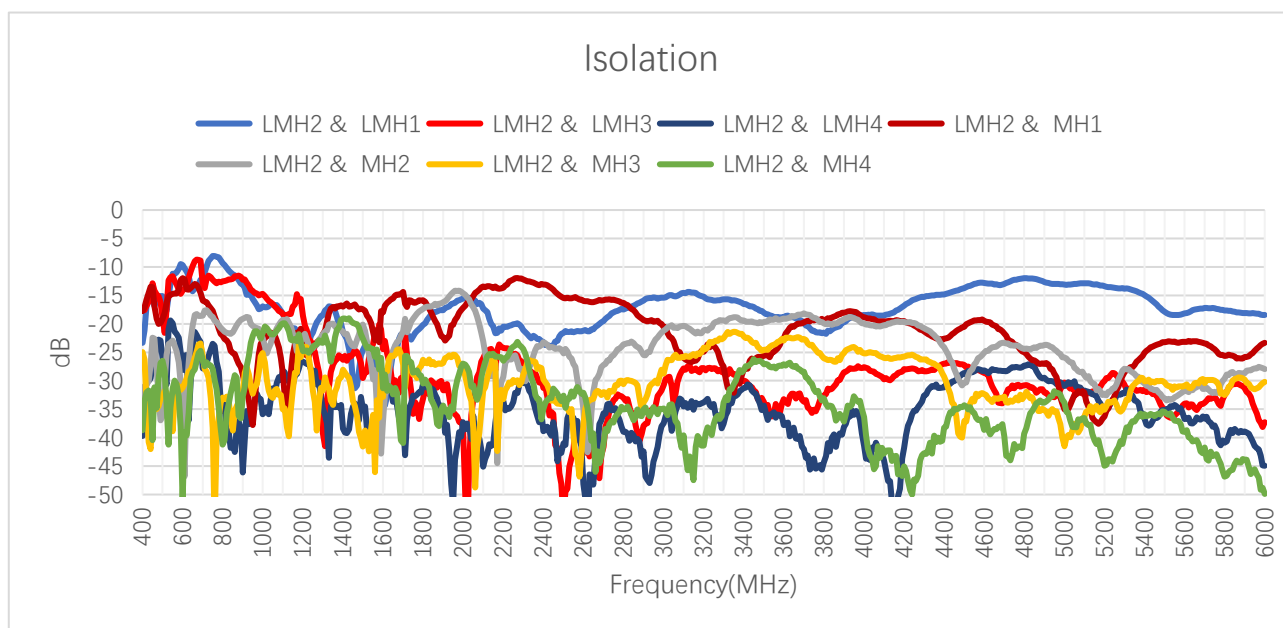
3.1.3. Isolation

3.1.3.1. Test Status: In Free Space

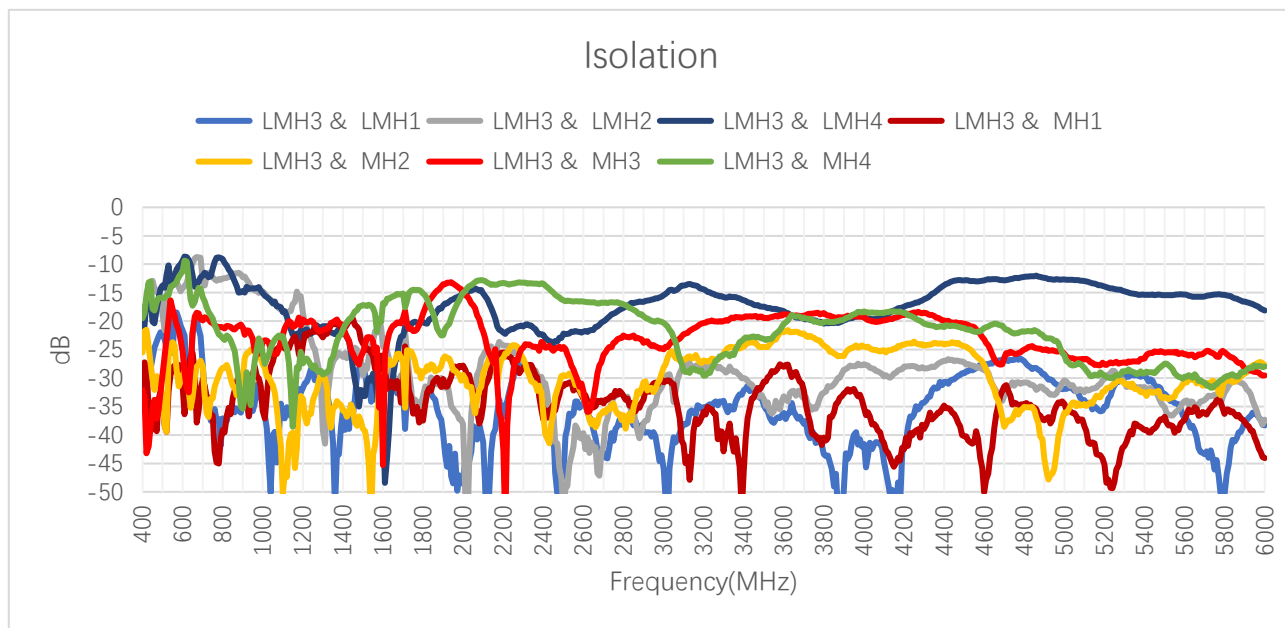
3.1.3.1.1. LMH1



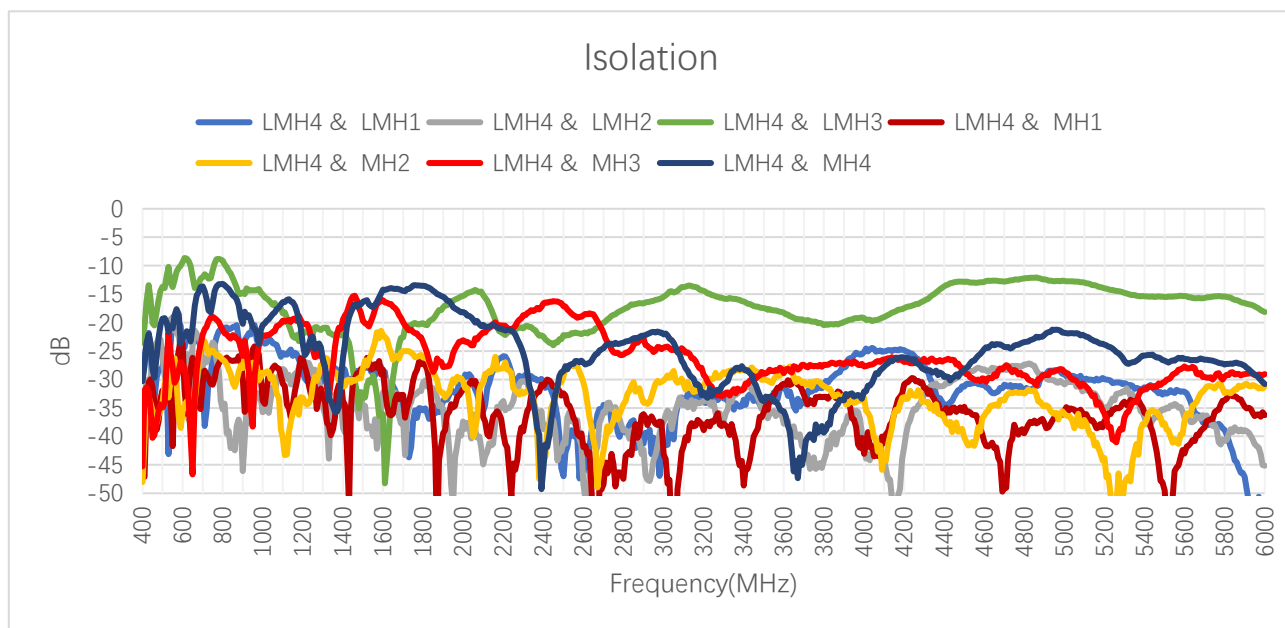
3.1.3.1.2. LMH2



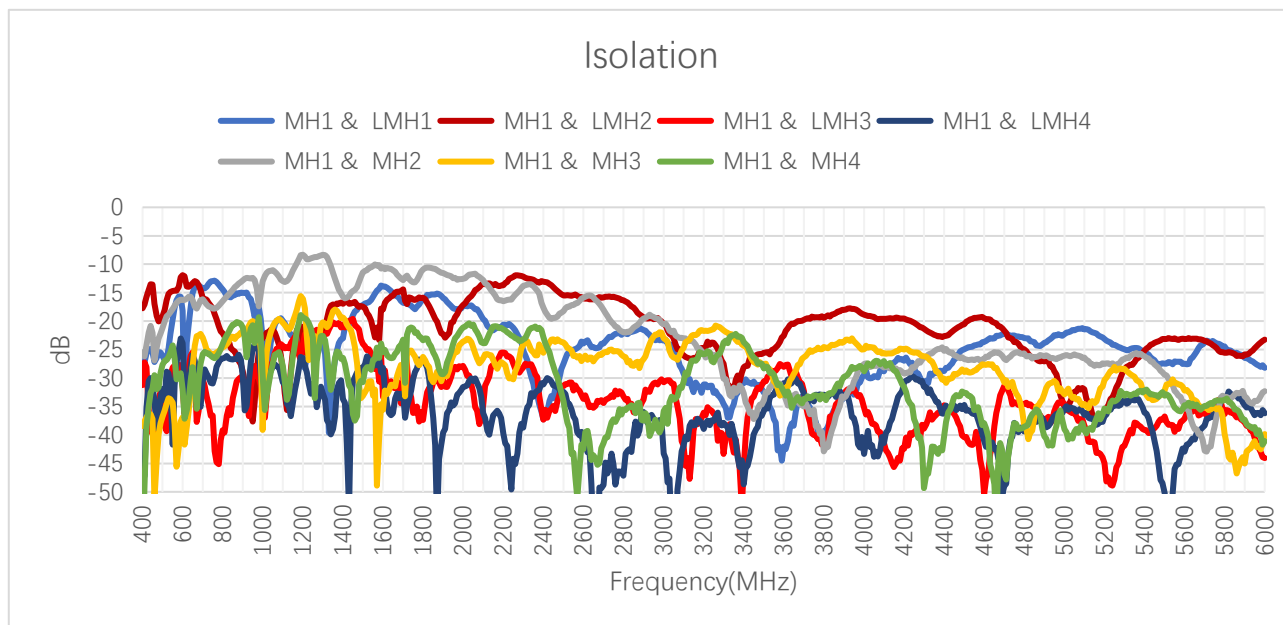
3.1.3.1.3. LMH3



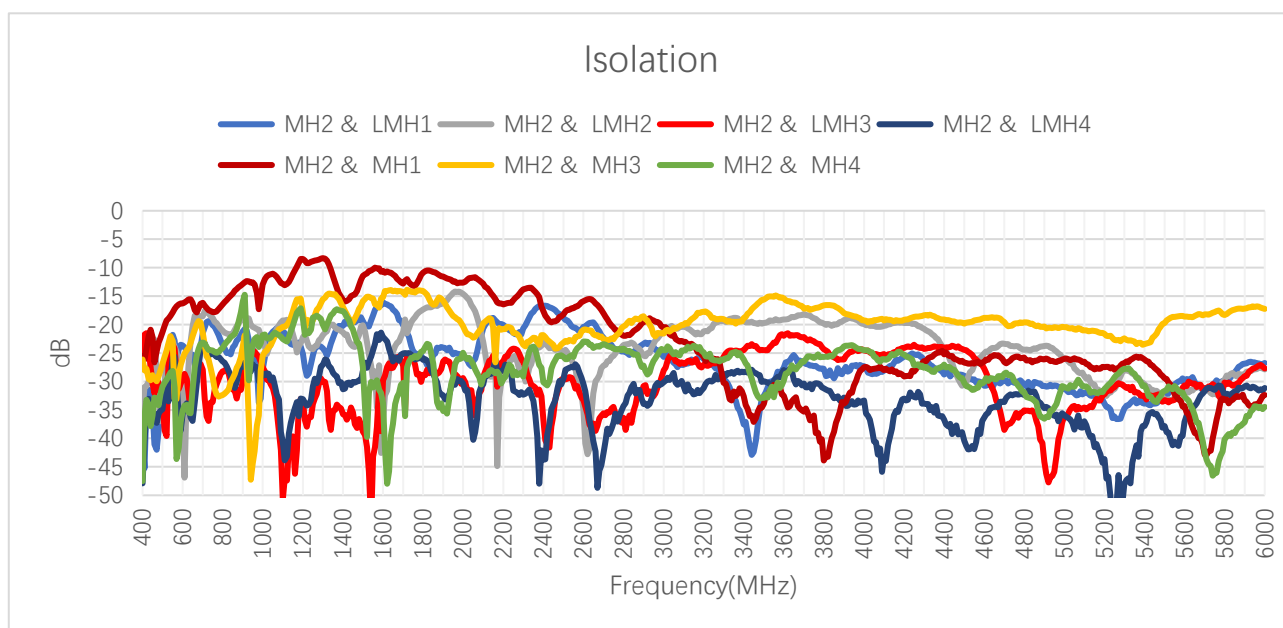
3.1.3.1.4. LMH4



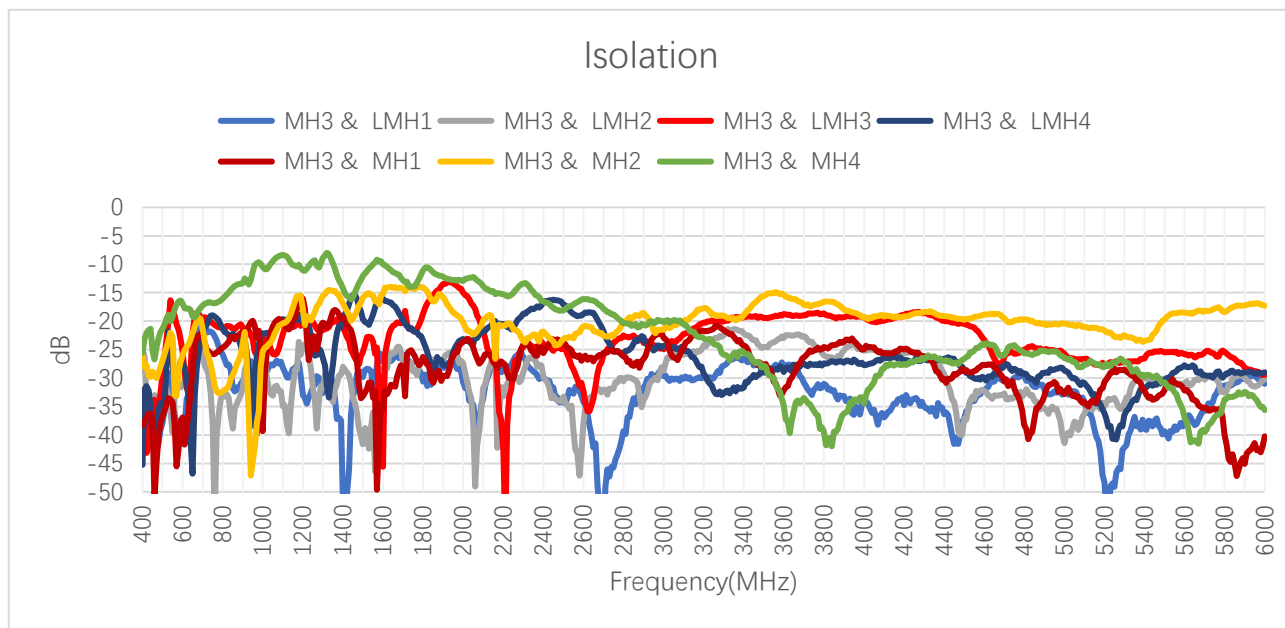
3.1.3.1.5. MH1



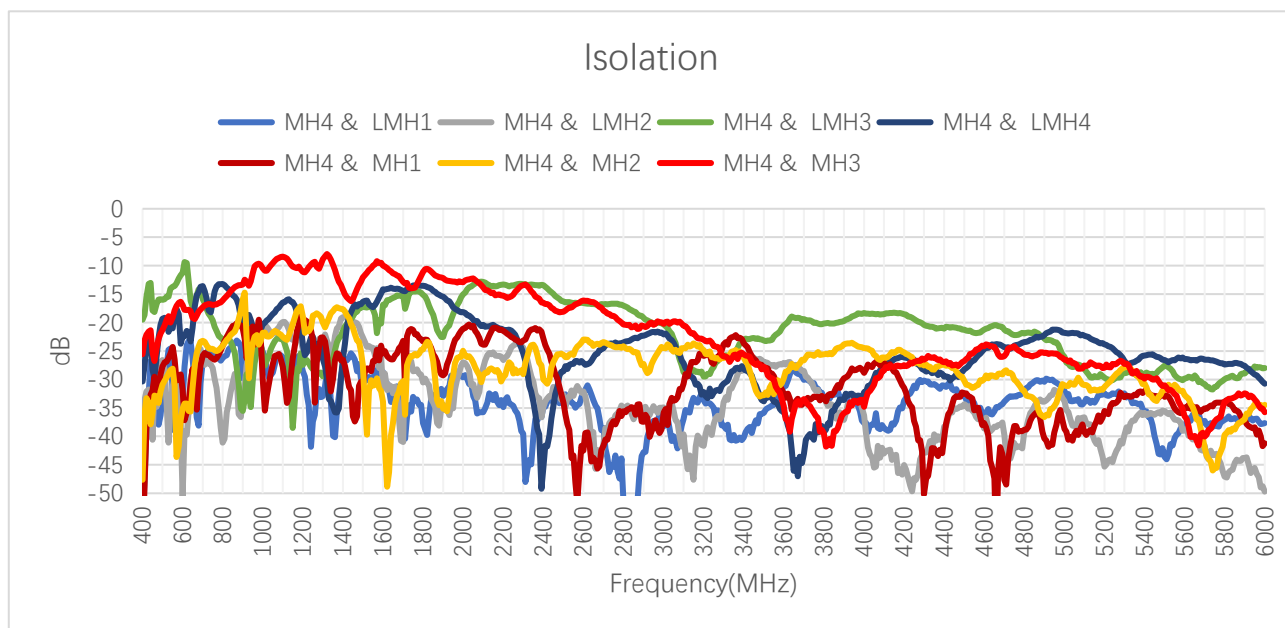
3.1.3.1.6. MH2



3.1.3.1.7. MH3

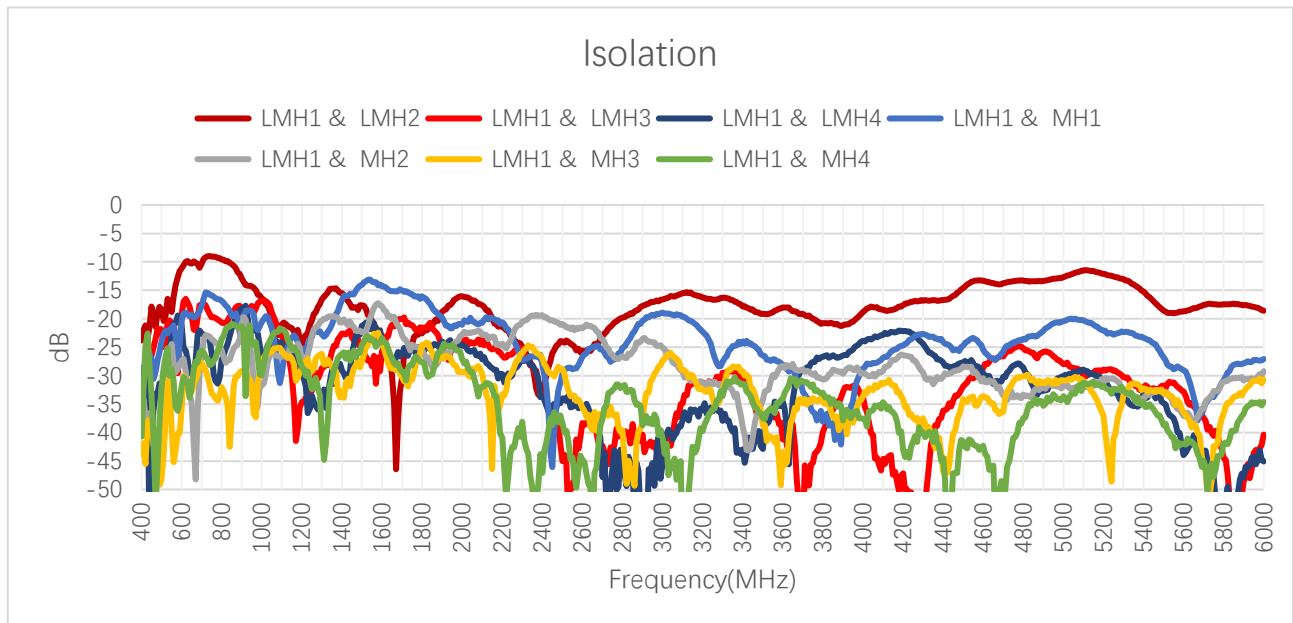


3.1.3.1.8. MH4

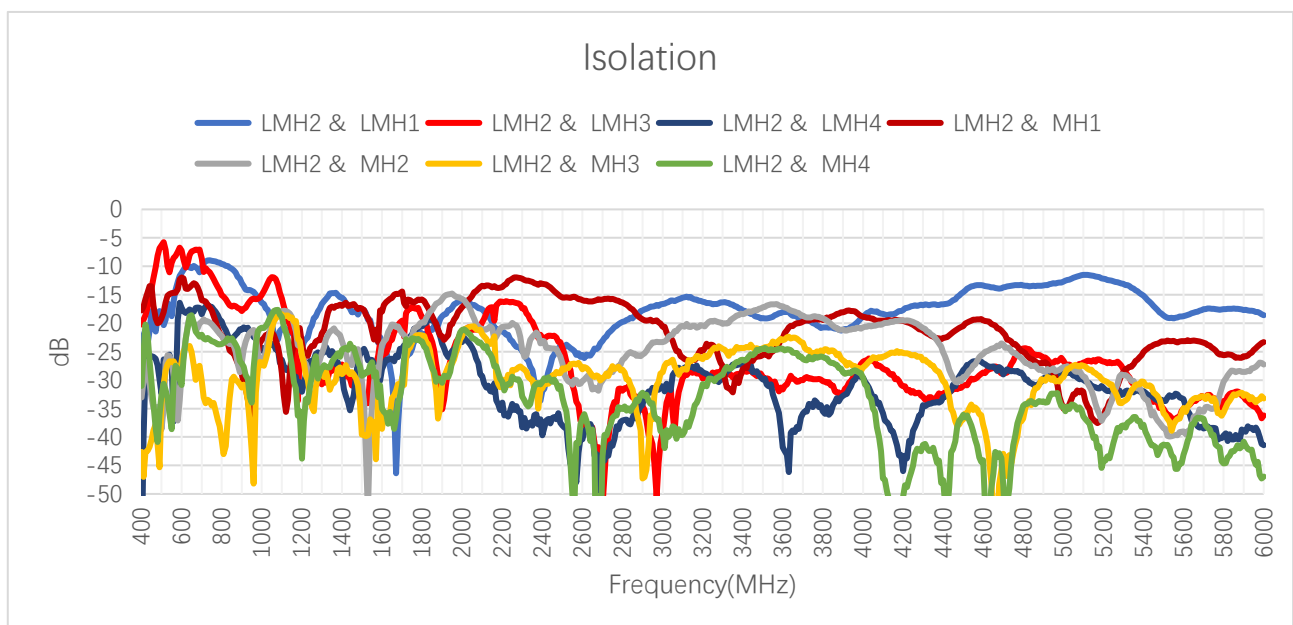


3.1.3.2. Test Status: On 500 × 500 mm Metal Plane

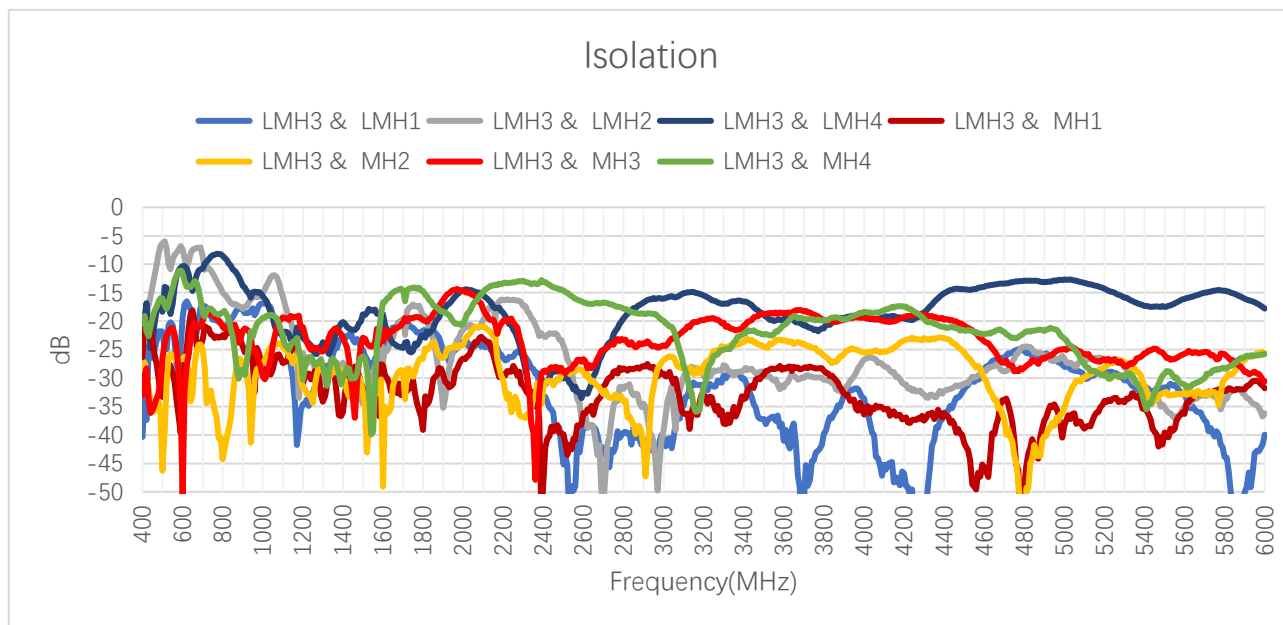
3.1.3.2.1. LMH1



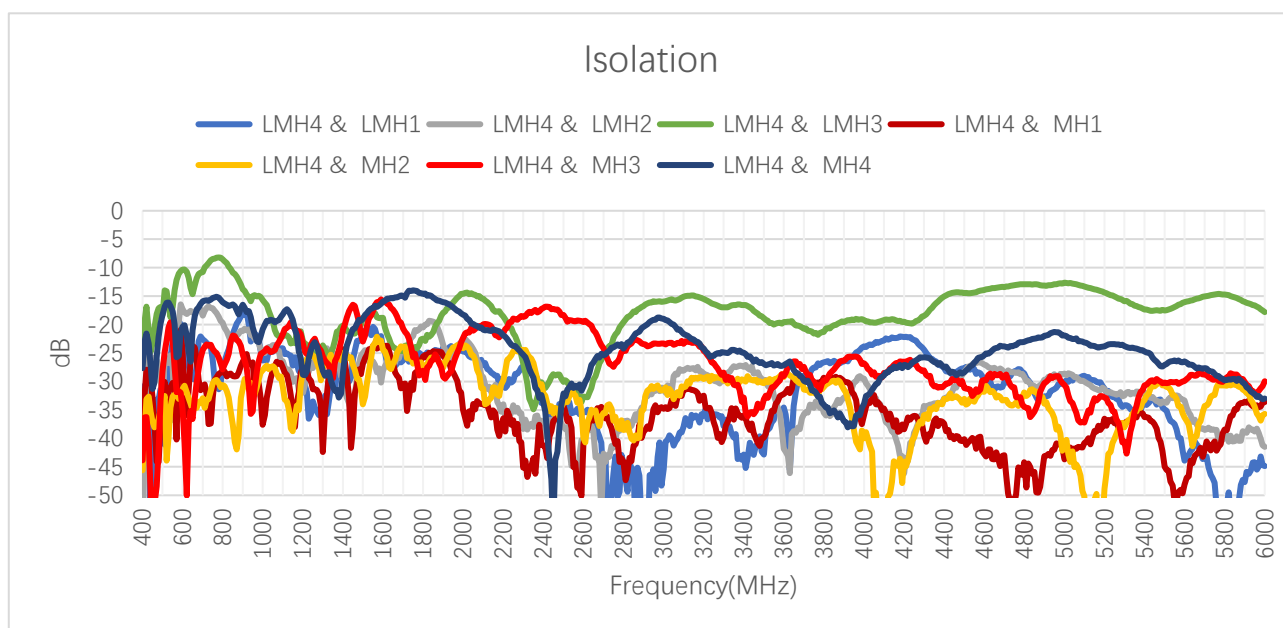
3.1.3.2.2. LMH2



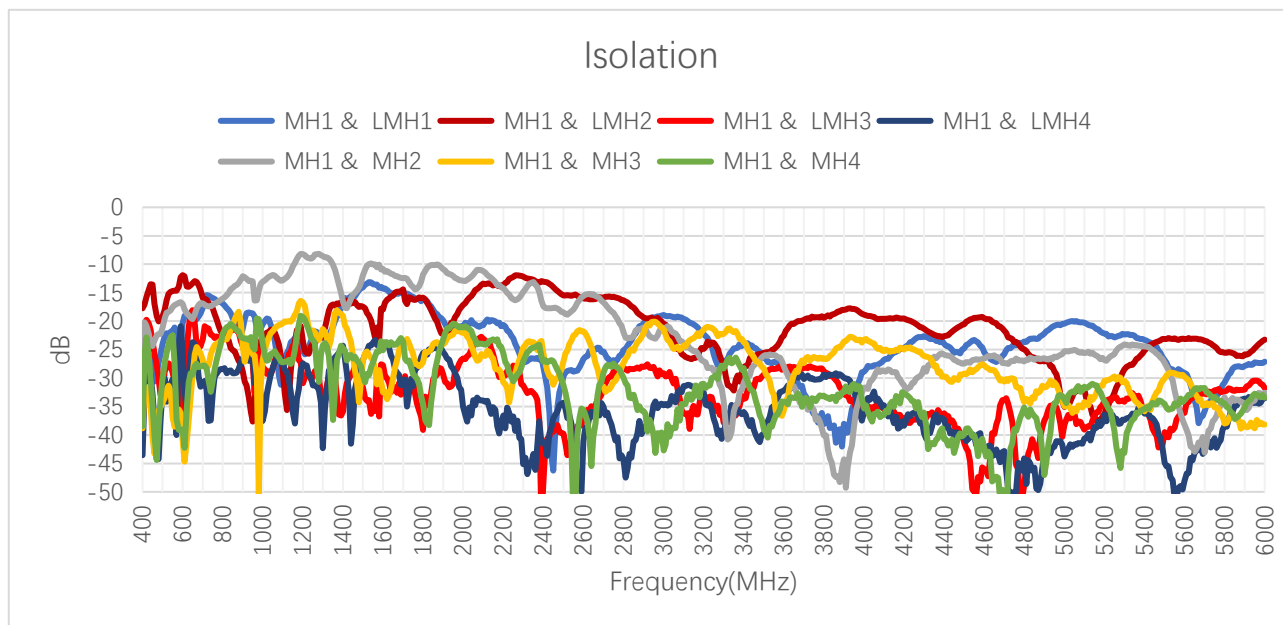
3.1.3.2.3. LMH3



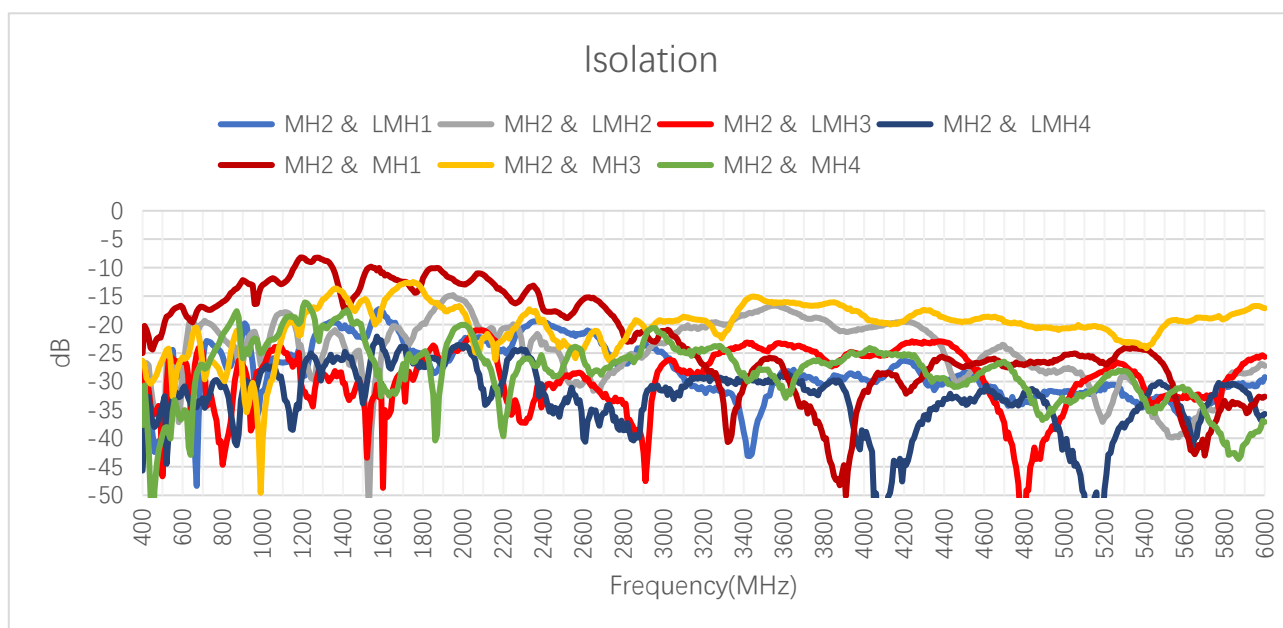
3.1.3.2.4. LMH4



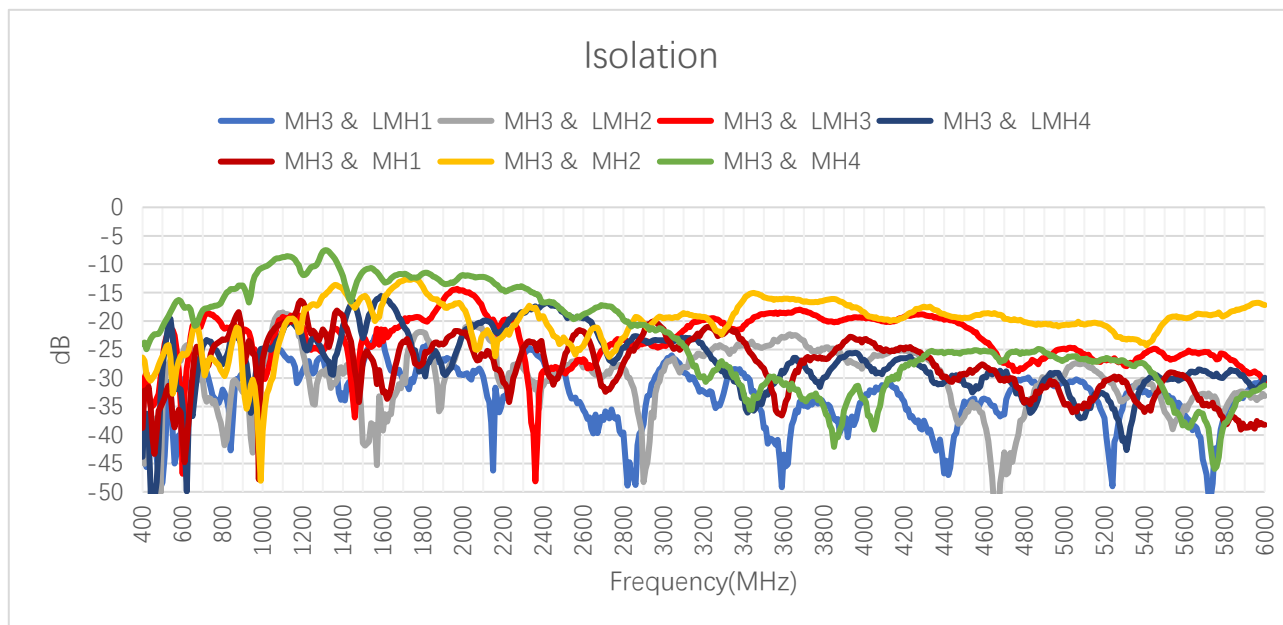
3.1.3.2.5. MH1



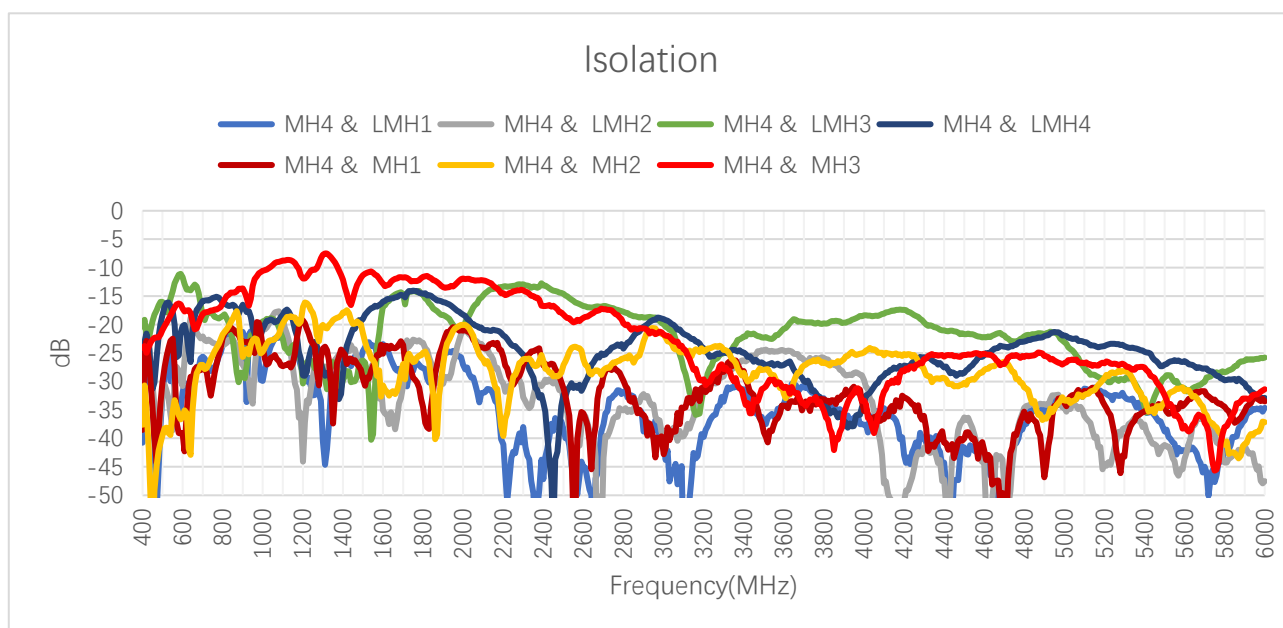
3.1.3.2.6. MH2



3.1.3.2.7. MH3

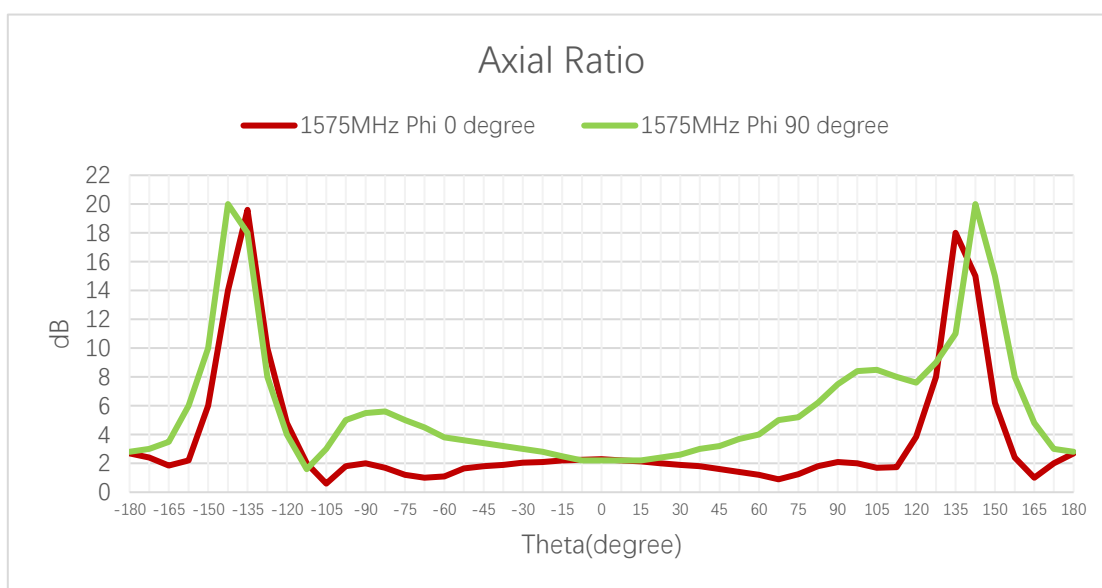
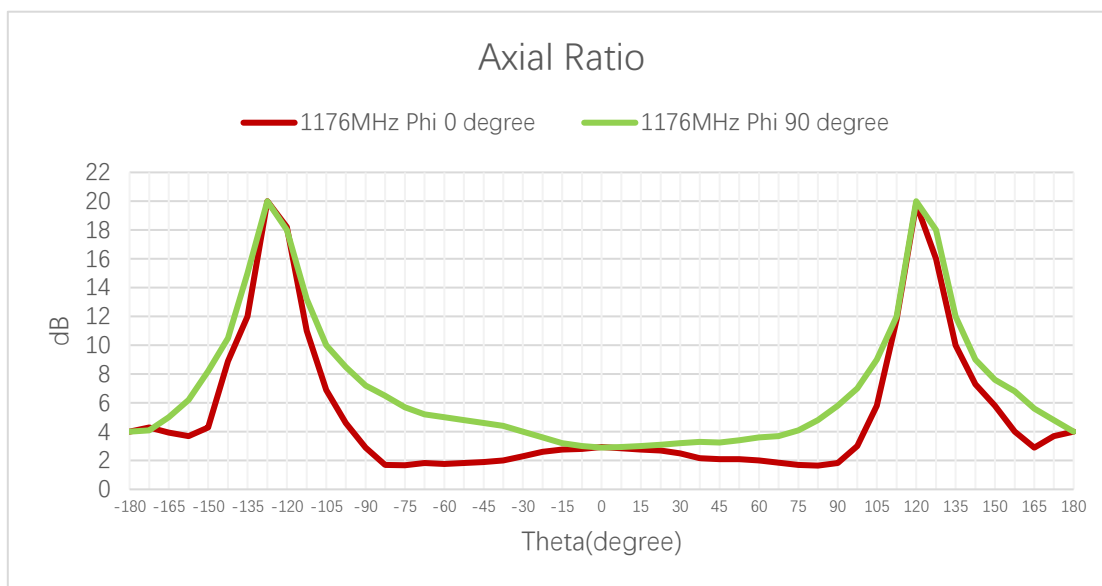


3.1.3.2.8. MH4



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

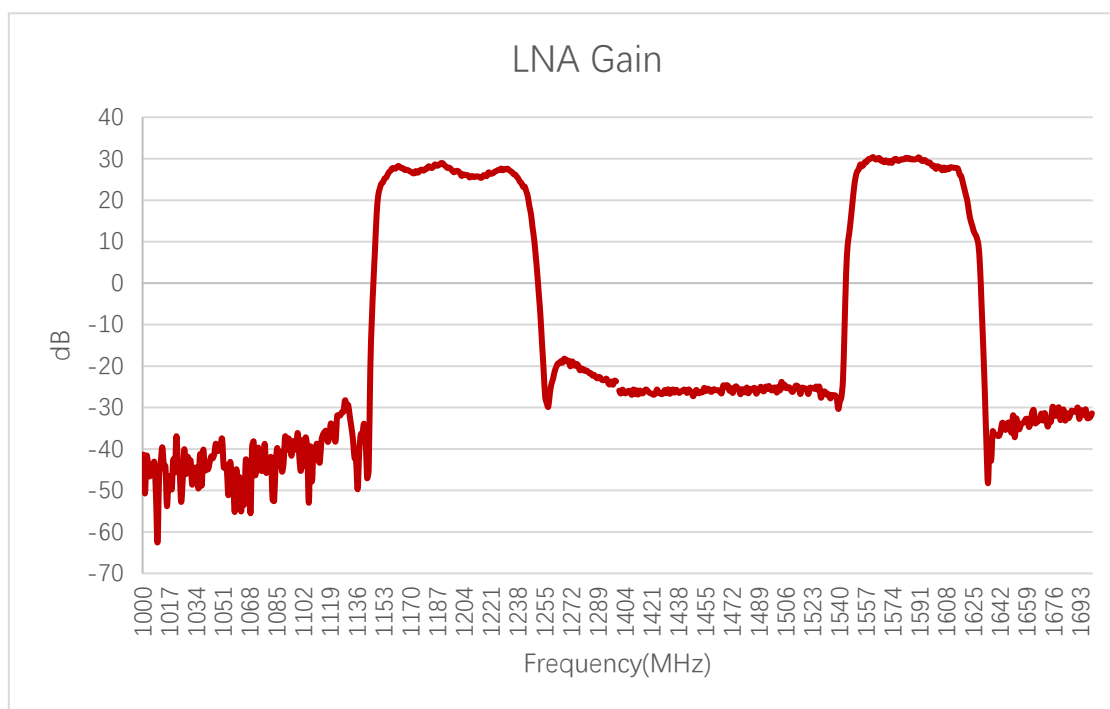
3.1.4. GNSS Axial Ratio



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

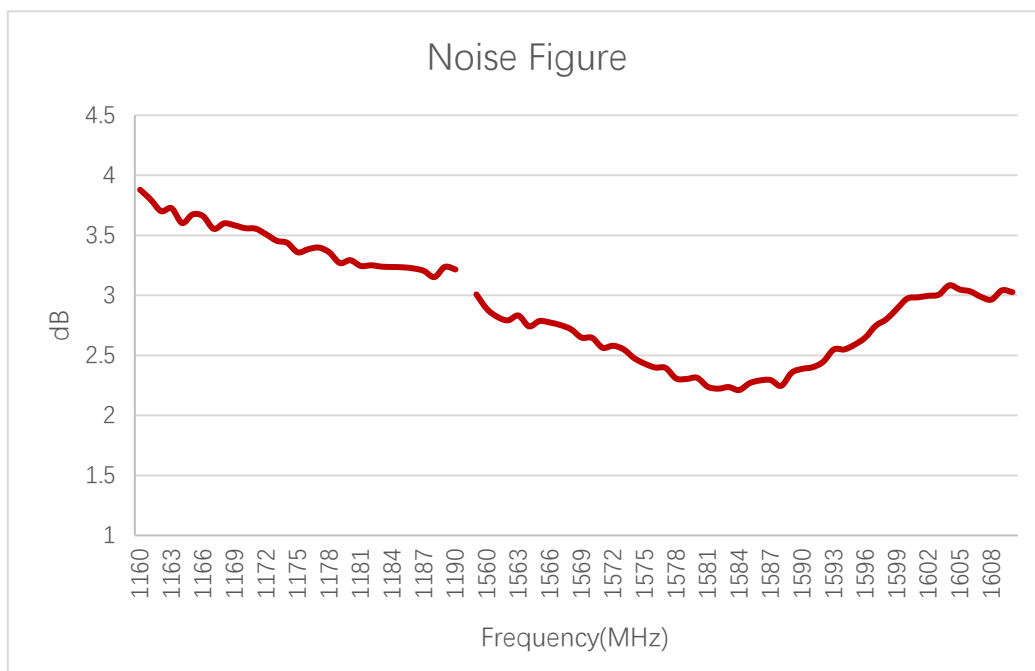
3.1.5. GNSS LNA Gain



LNA Gain (dB)

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

3.1.6. GNSS Noise Figure

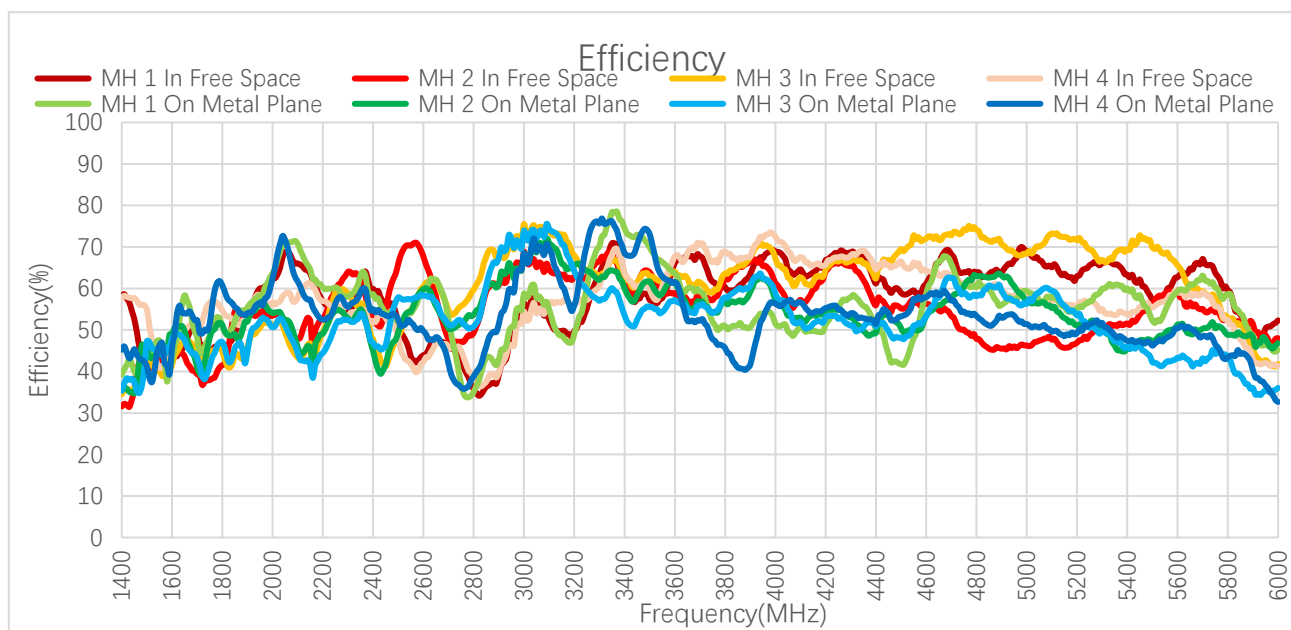
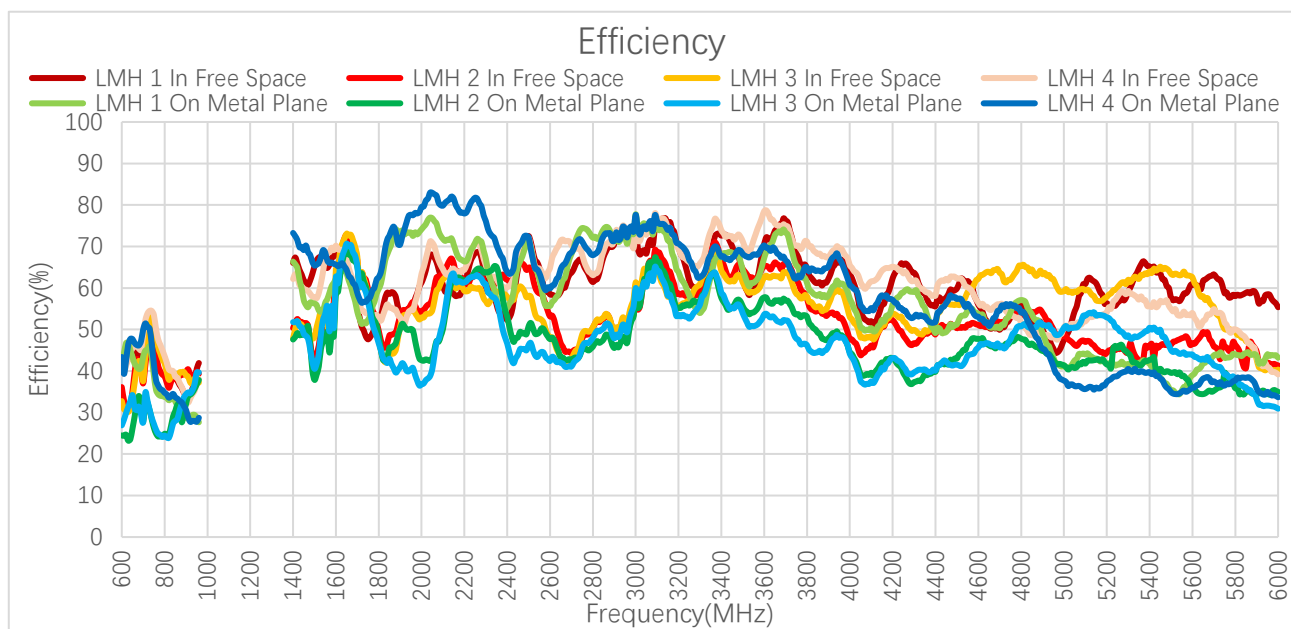


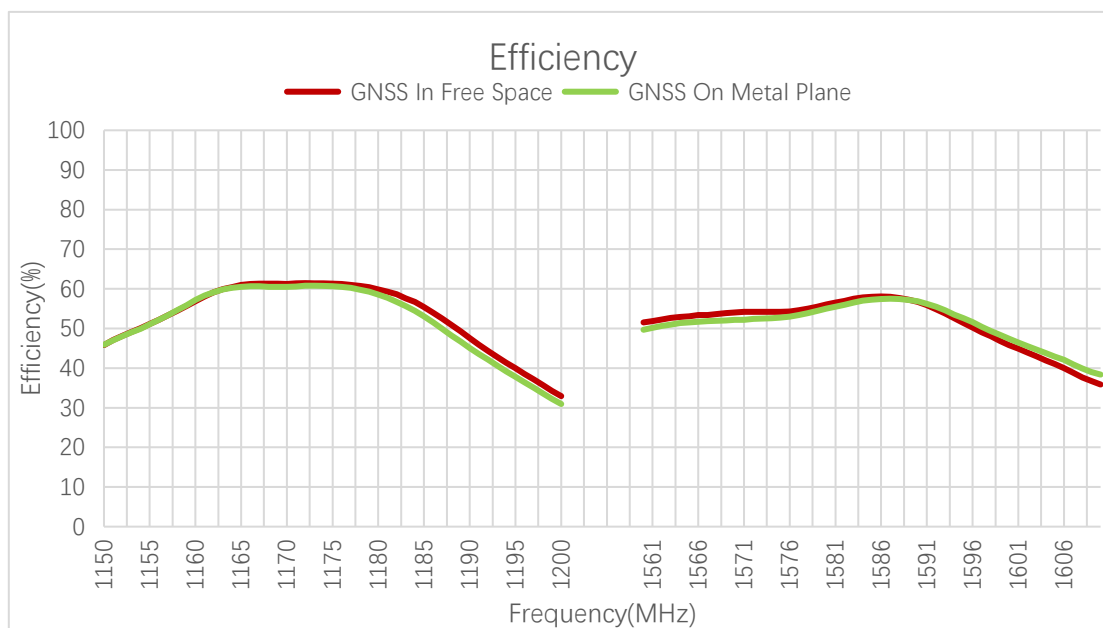
Noise Figure (dB)

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

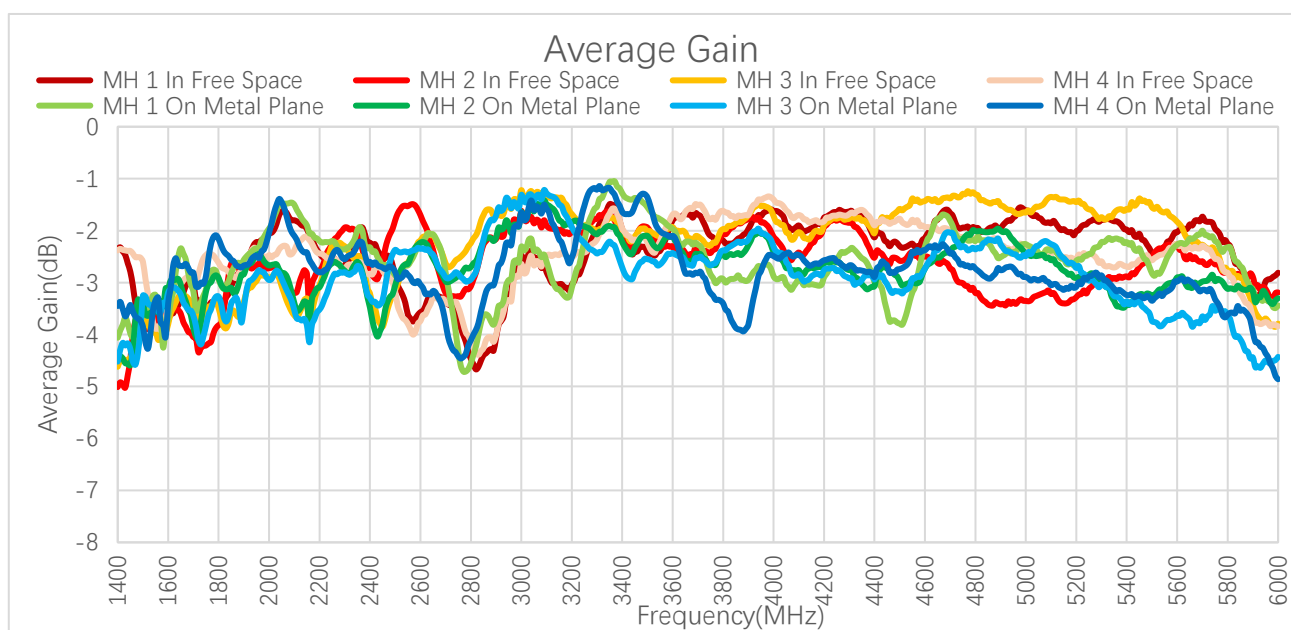
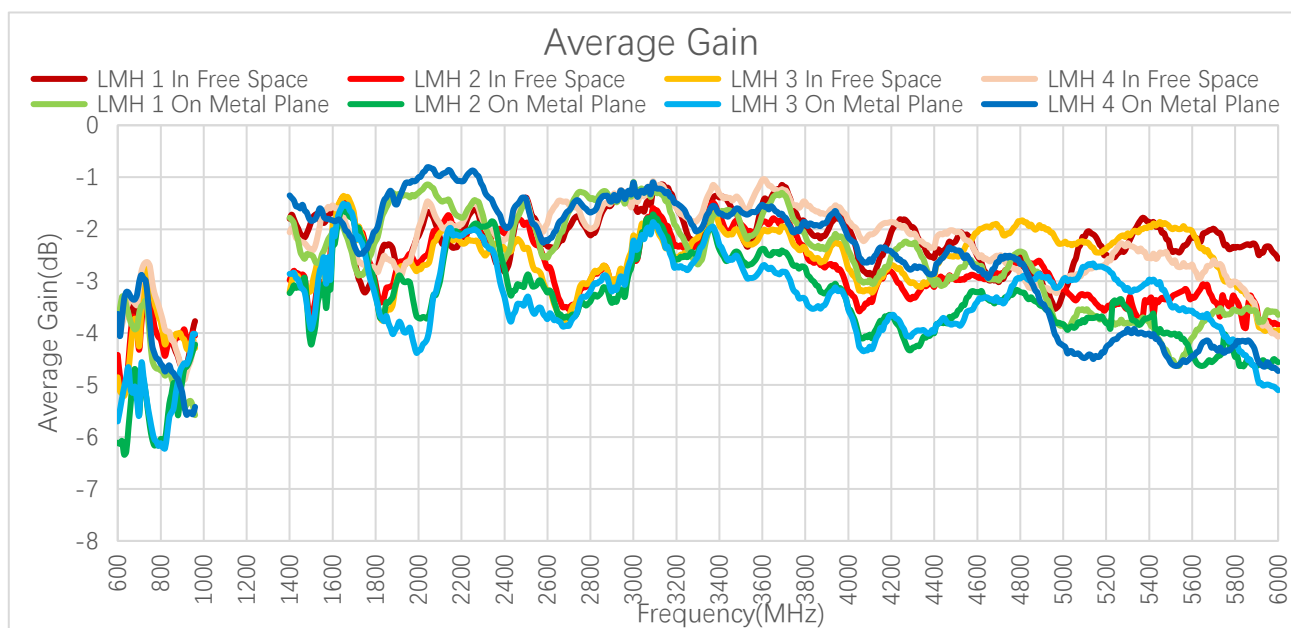
Efficiency (%)

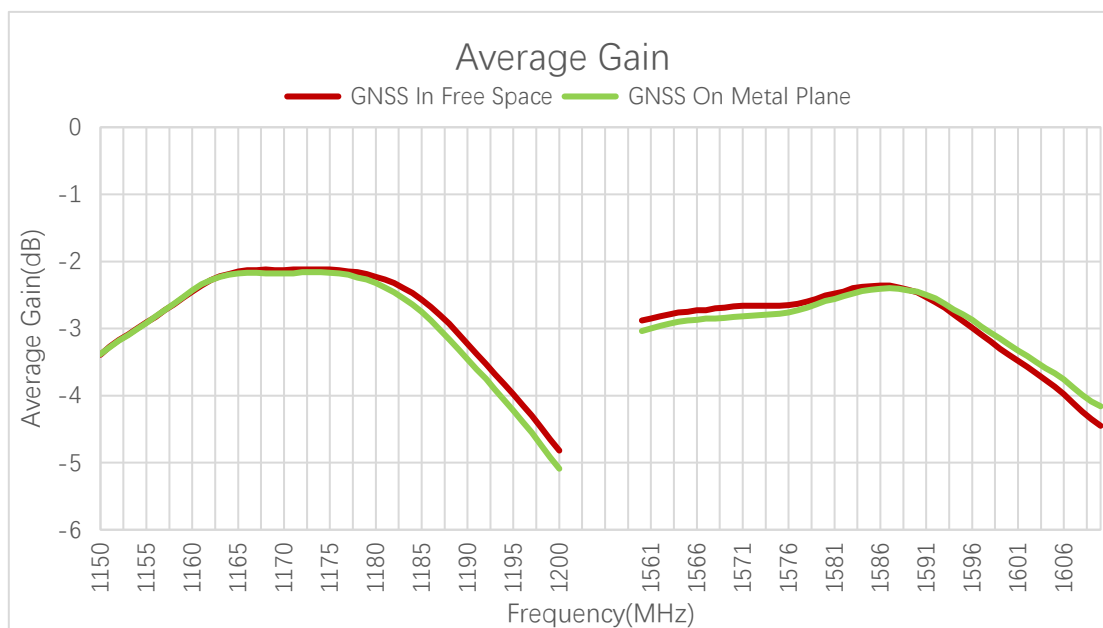
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	54.6	46.7	45.2	52.3
	MP	-	-	-	-	-	-	43.6	50.9	52.7	57.4
MH2	FS	-	-	-	-	-	-	33.2	39.1	37.9	53.3
	MP	-	-	-	-	-	-	45.8	49.8	51.7	54.7
MH3	FS	-	-	-	-	-	-	35.7	44.4	43.5	43.0
	MP	-	-	-	-	-	-	40.8	43.5	47.1	50.7
MH4	FS	-	-	-	-	-	-	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

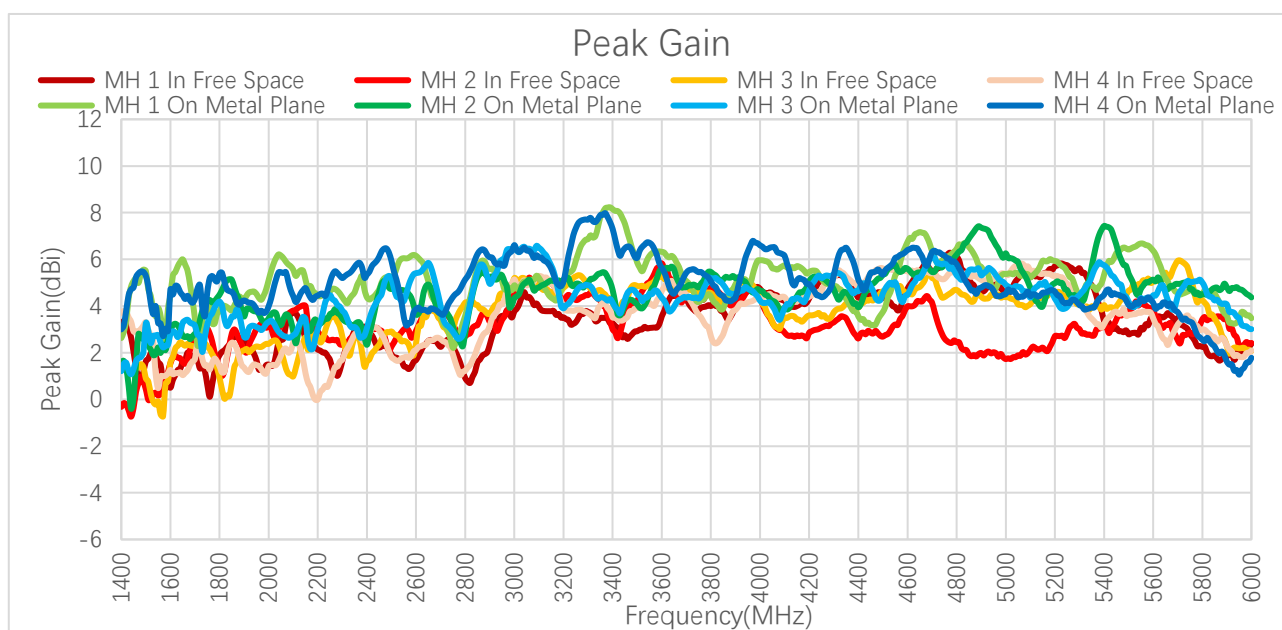
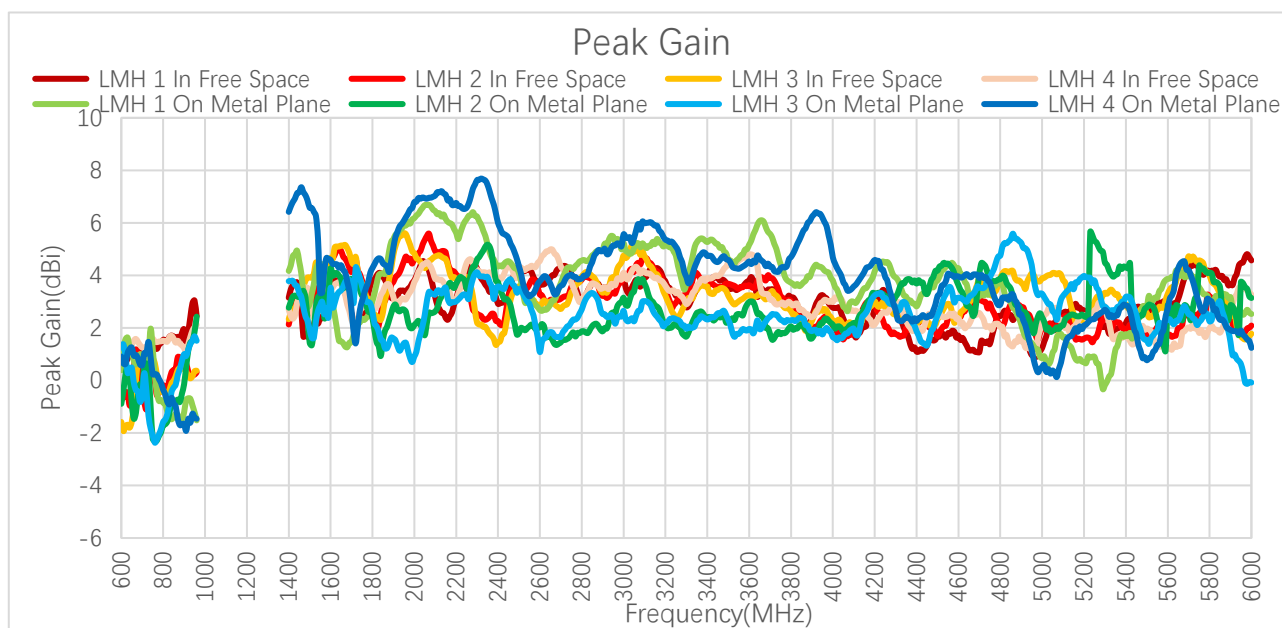
Average Gain (dB)

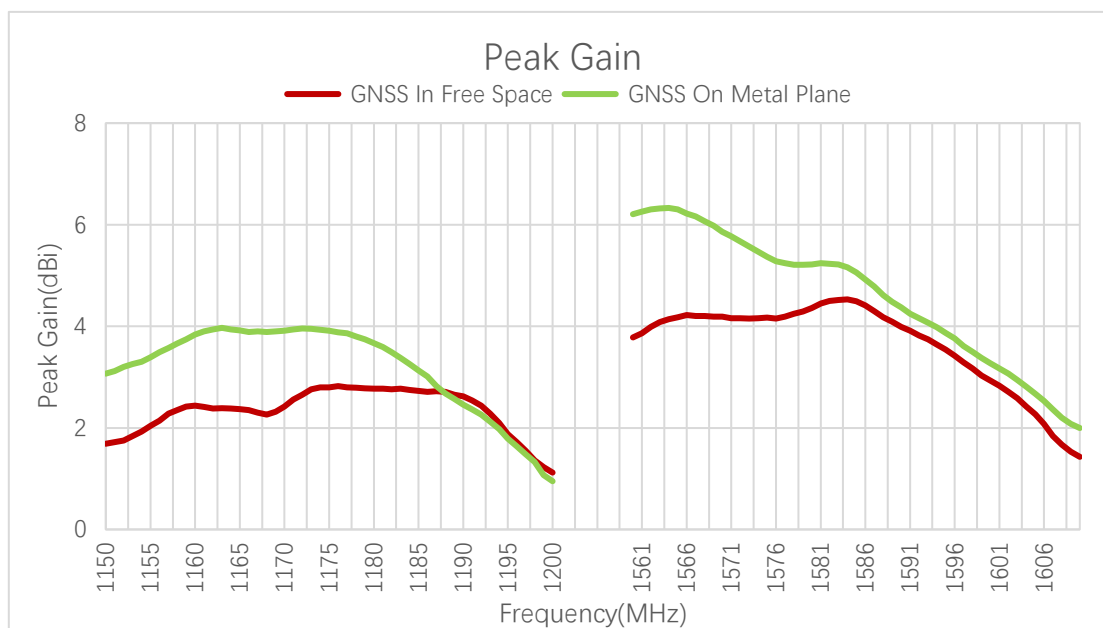
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	-2.6	-3.3	-3.5	-2.8
	MP	-	-	-	-	-	-	-3.6	-2.9	-2.8	-2.4
MH2	FS	-	-	-	-	-	-	-4.8	-4.1	-4.2	-2.7
	MP	-	-	-	-	-	-	-3.4	-3.0	-2.9	-2.6
MH3	FS	-	-	-	-	-	-	-4.5	-3.5	-3.6	-3.7
	MP	-	-	-	-	-	-	-3.9	-3.6	-3.3	-3.0
MH4	FS	-	-	-	-	-	-	-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)

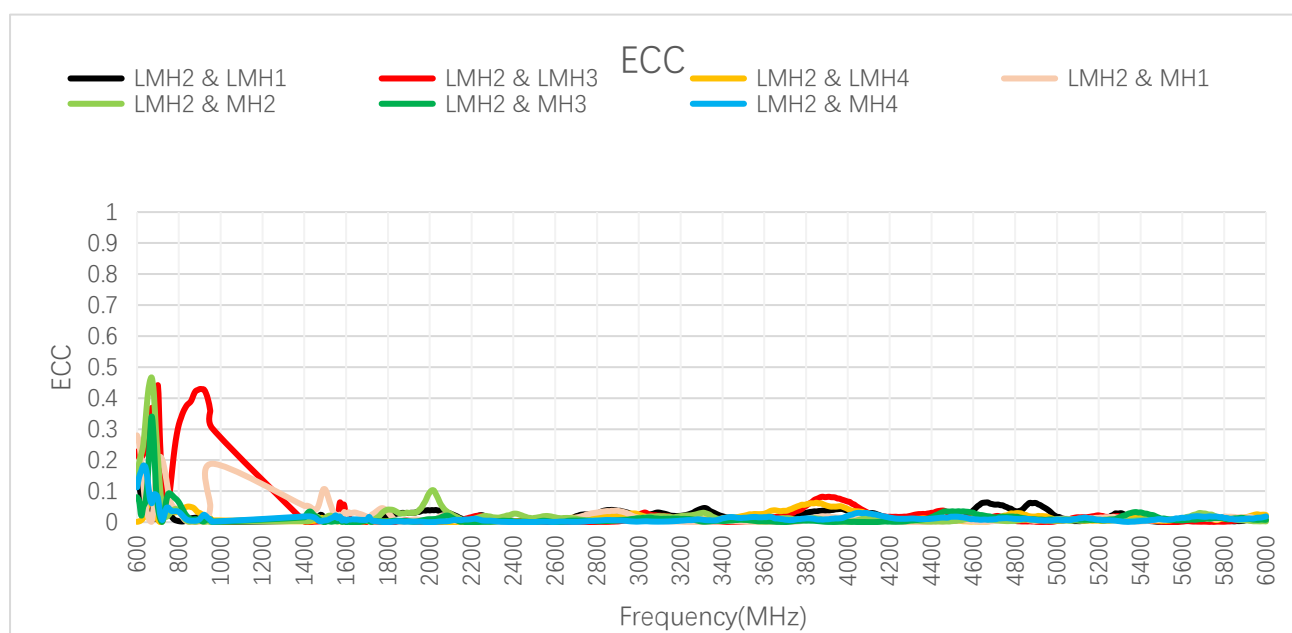
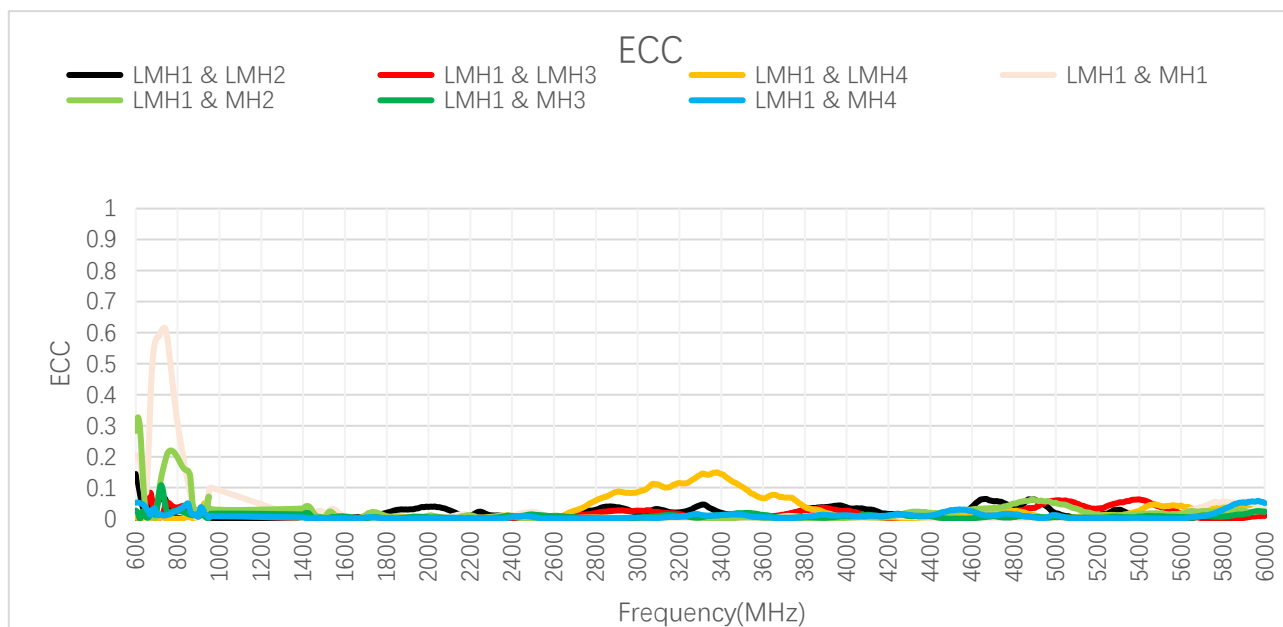
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	2.6	1.7	1.2	2.6
	MP	-	-	-	-	-	-	5.6	3.9	3.7	4.6
MH2	FS	-	-	-	-	-	-	-0.7	2.7	3.0	2.6
	MP	-	-	-	-	-	-	2.6	4.3	4.4	3.8
MH3	FS	-	-	-	-	-	-	1.2	2.2	2.4	2.0
	MP	-	-	-	-	-	-	2.0	3.5	4.1	3.2
MH4	FS	-	-	-	-	-	-	3.3	2.5	1.5	1.8
	MP	-	-	-	-	-	-	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

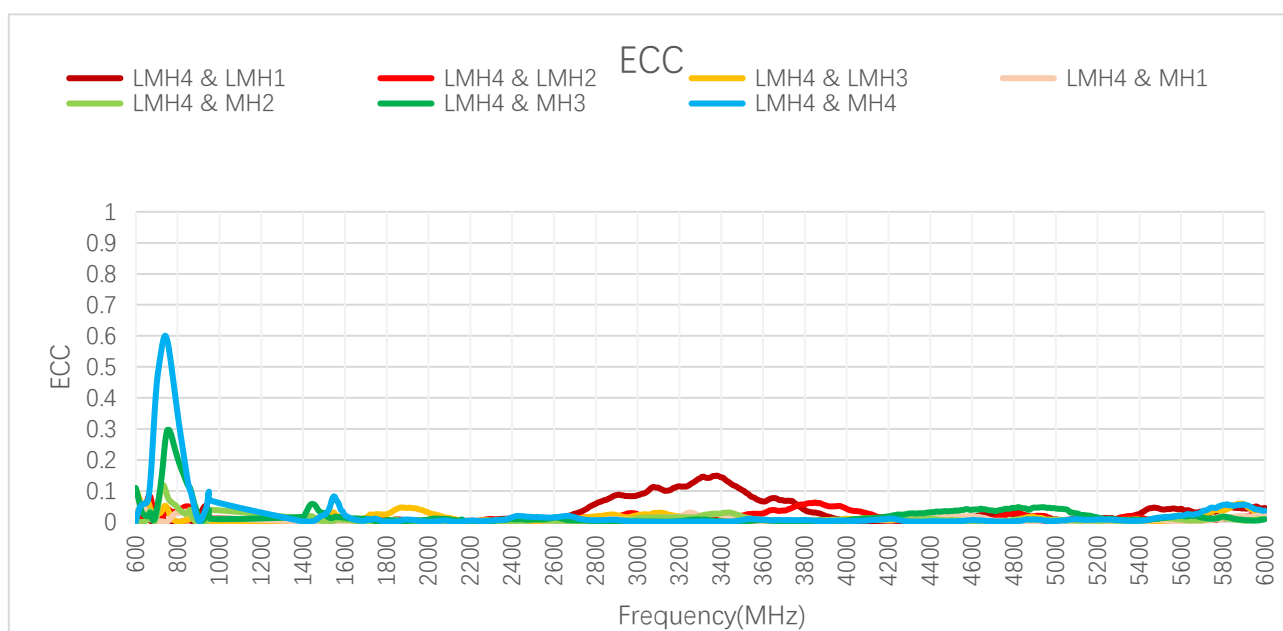
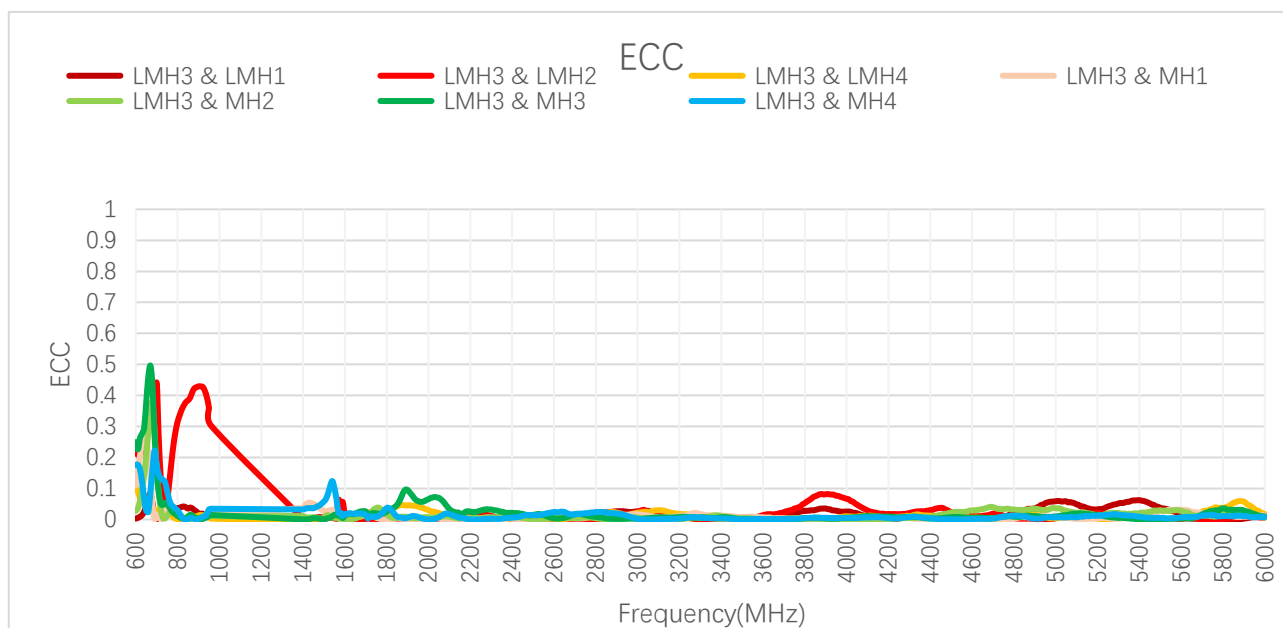
Peak Gain (dBi)

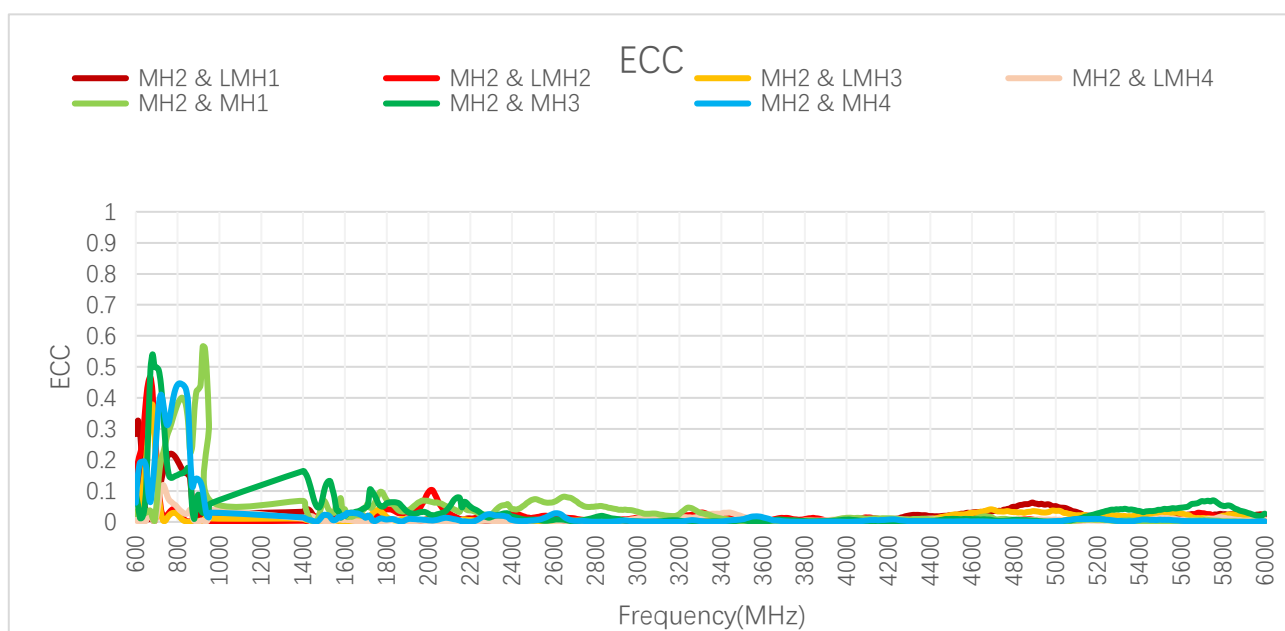
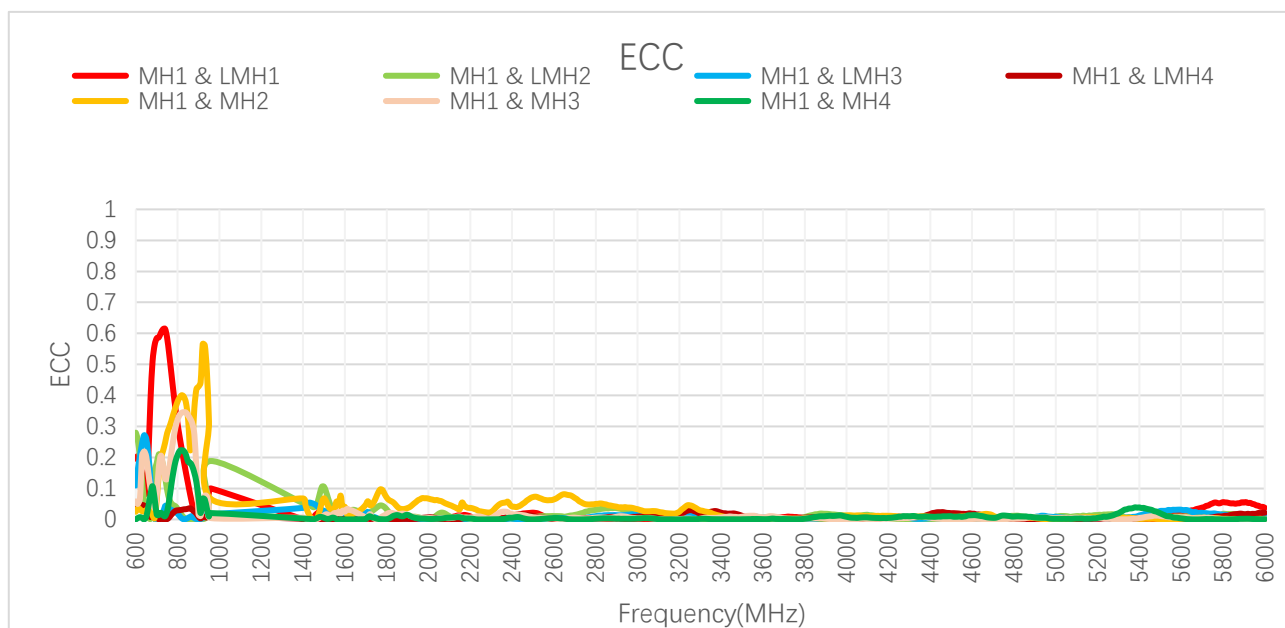
Frequency (MHz)		1176	1227	1561	1575	1602
GNSS	FS	2.8	-	3.9	4.2	2.7
	MP	3.9	-	6.3	5.4	3.1

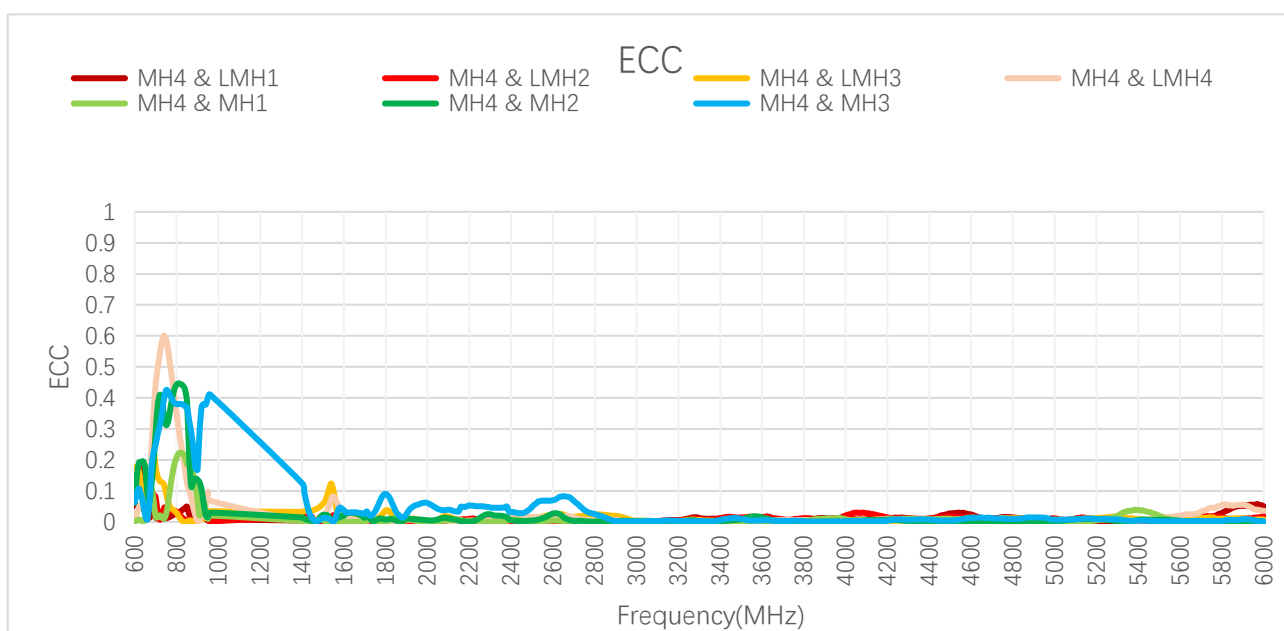
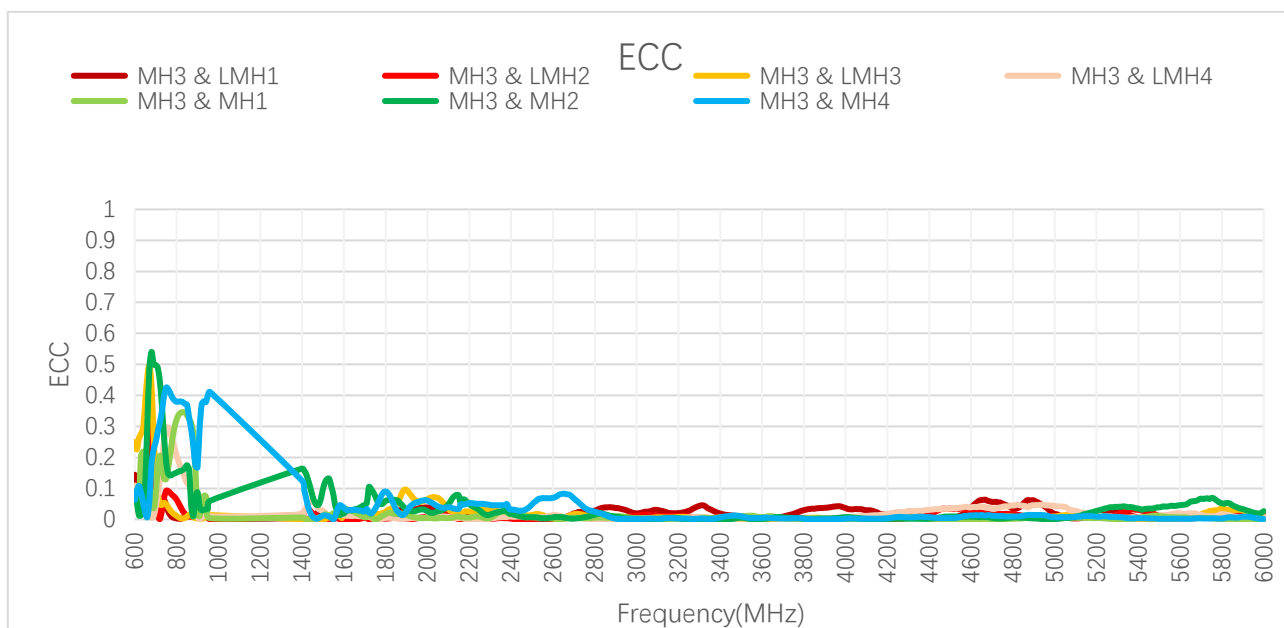
3.2.4. ECC

3.2.4.1. Test Status: In Free Space

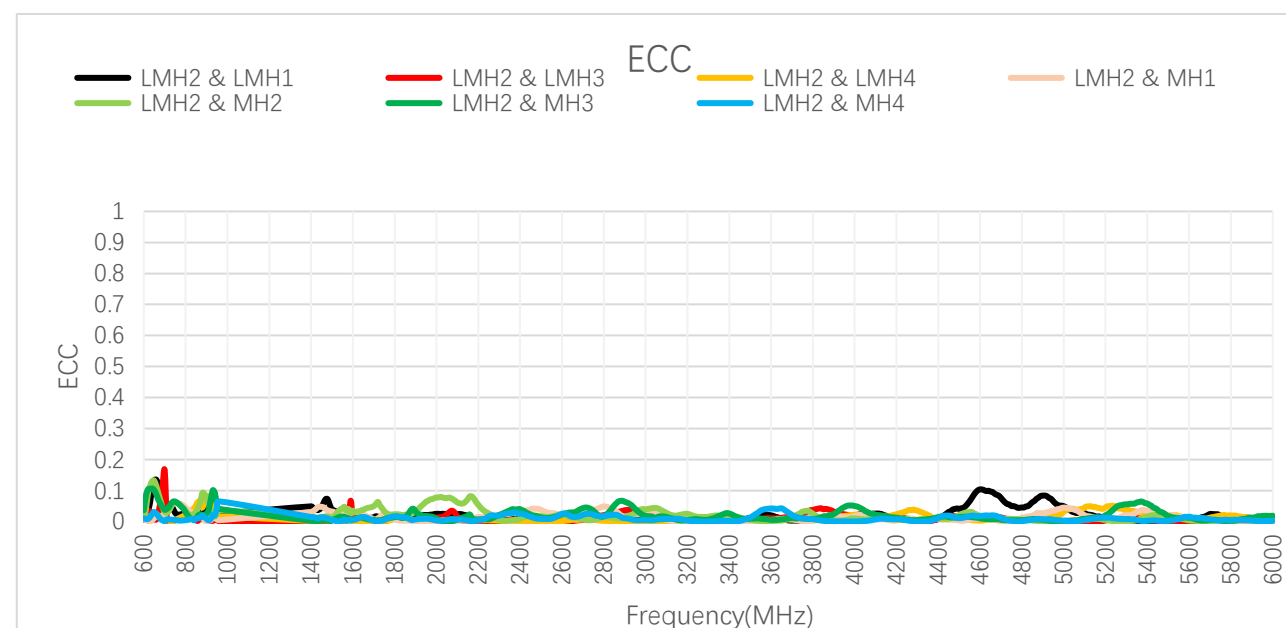
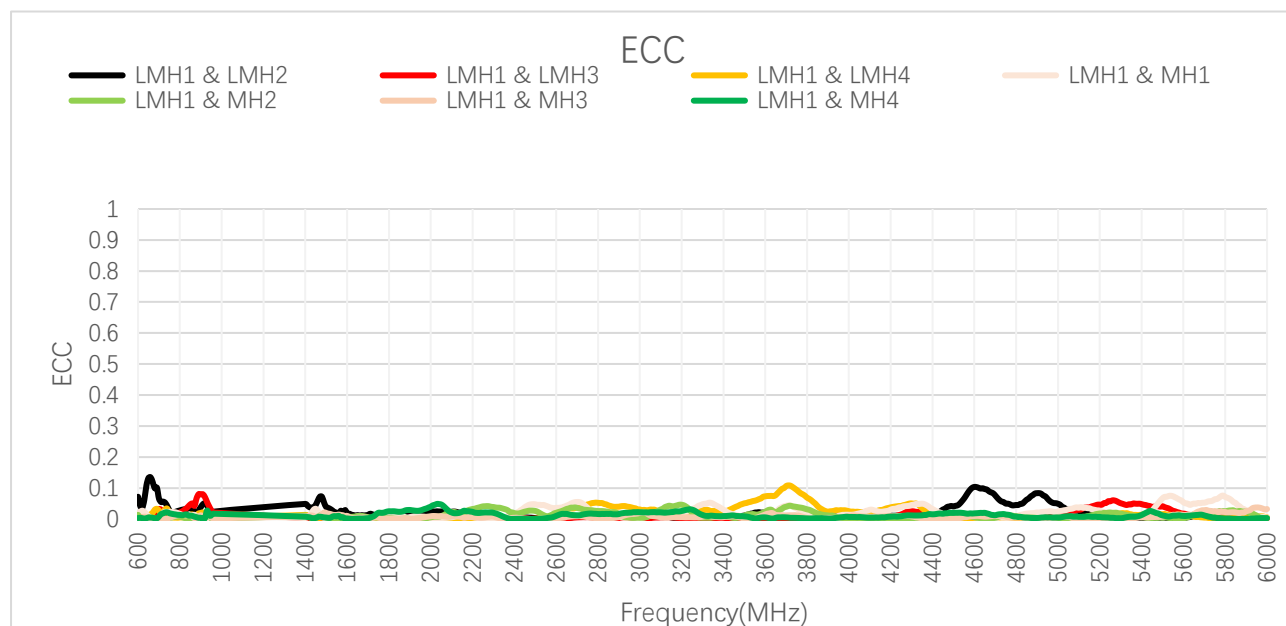


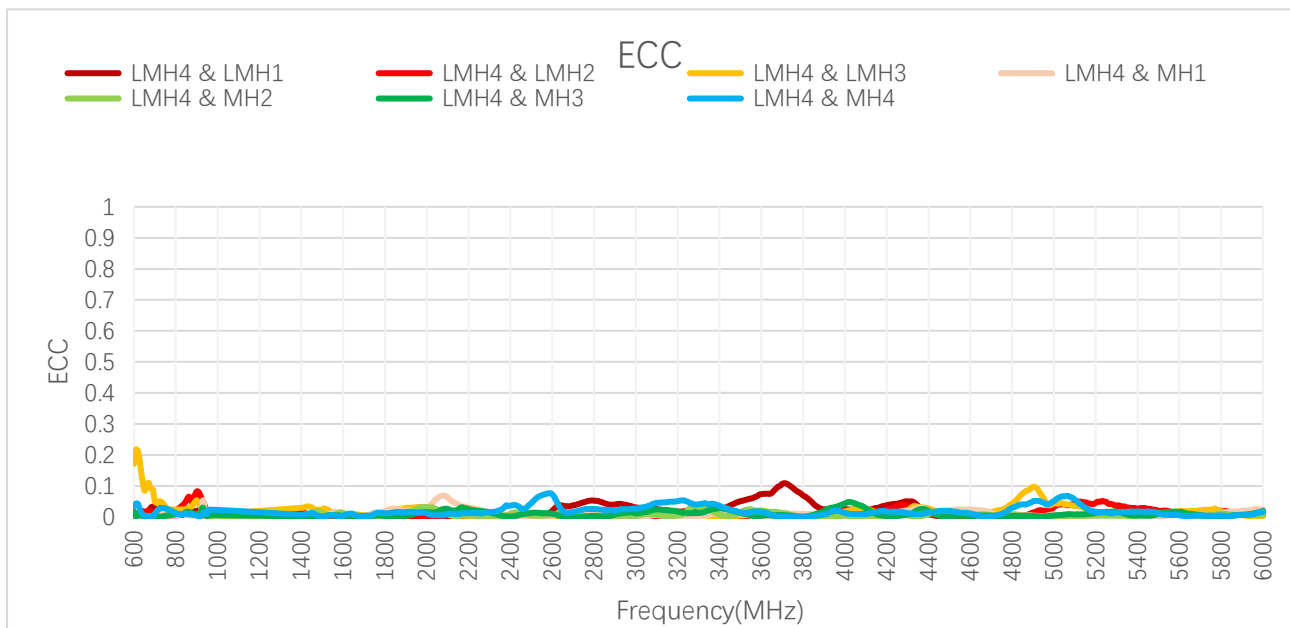
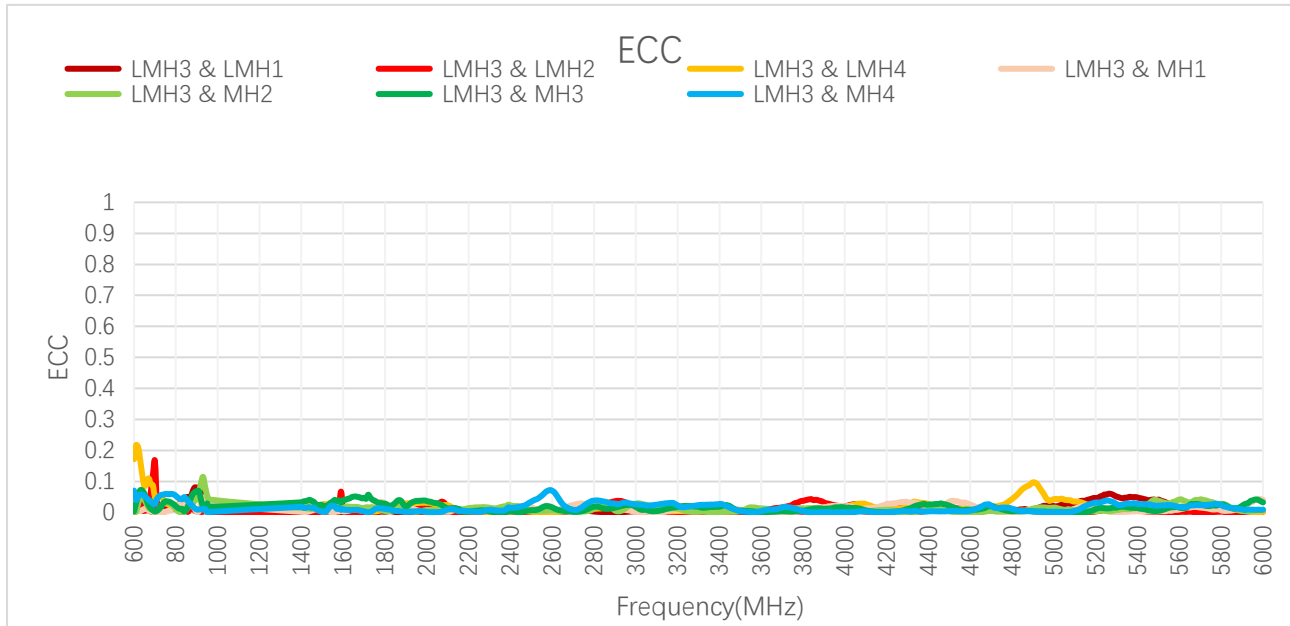


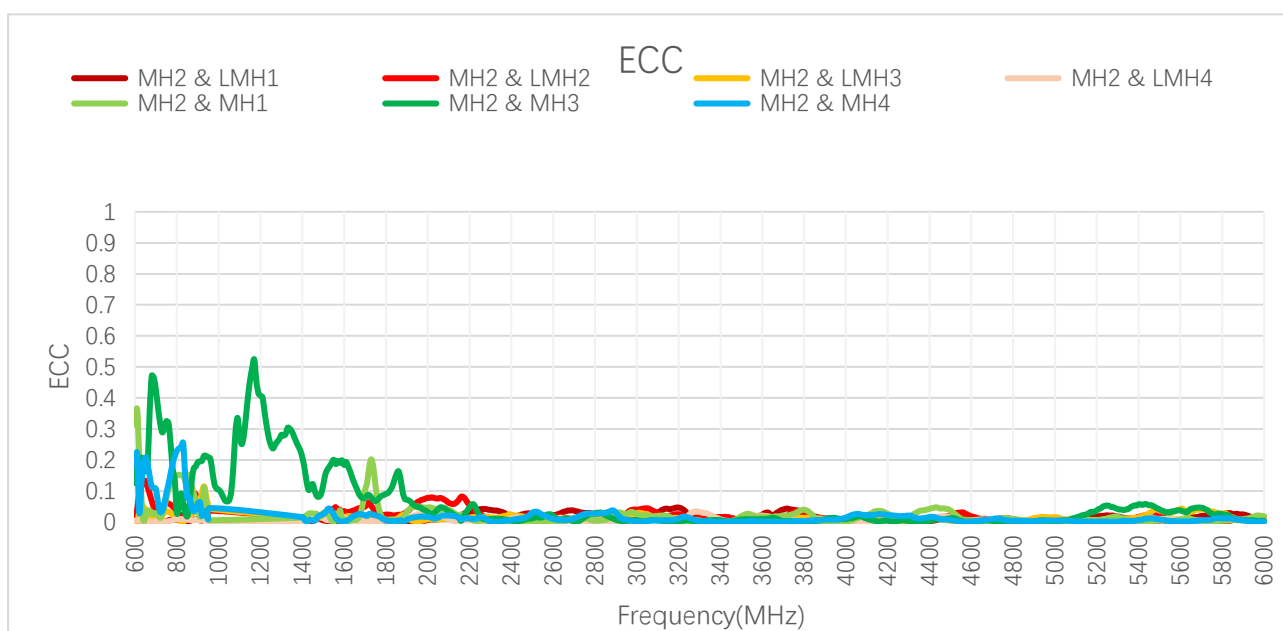
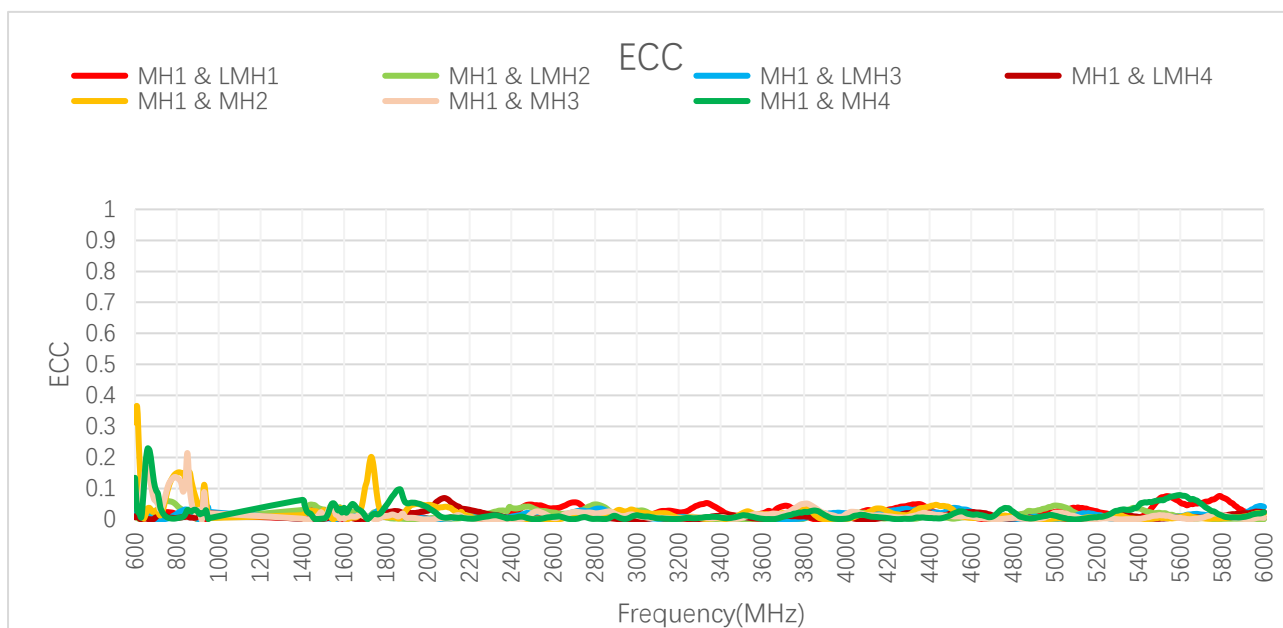


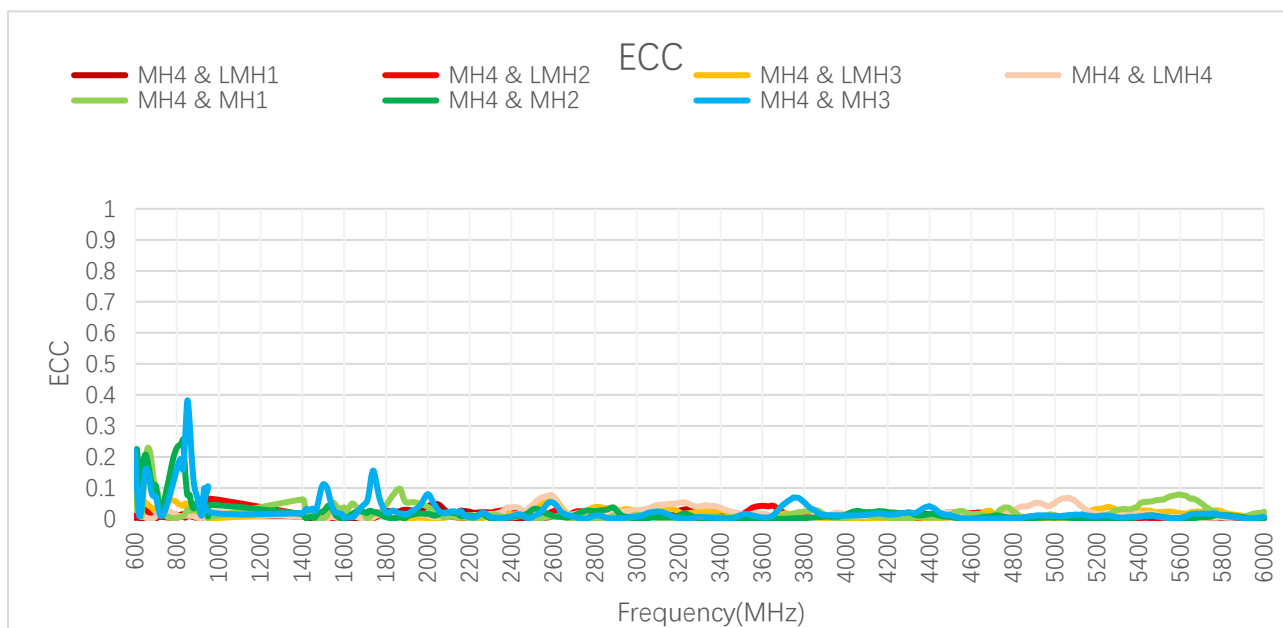
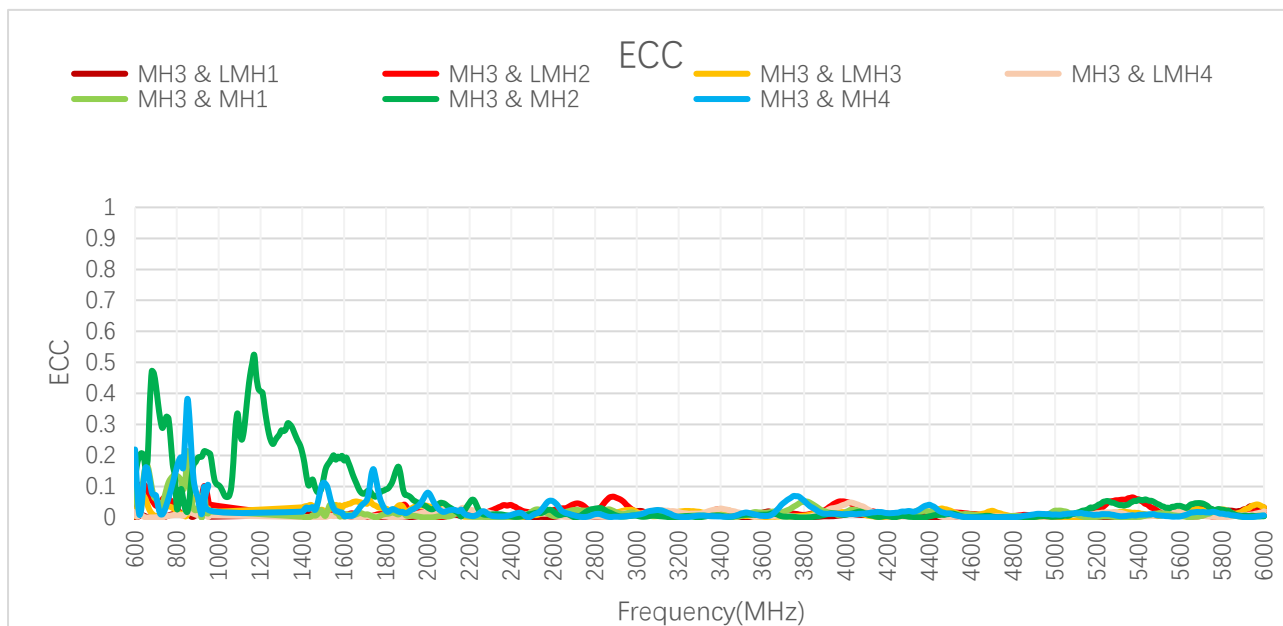


3.2.4.2. Test Status: On 500 × 500 mm Metal Plane





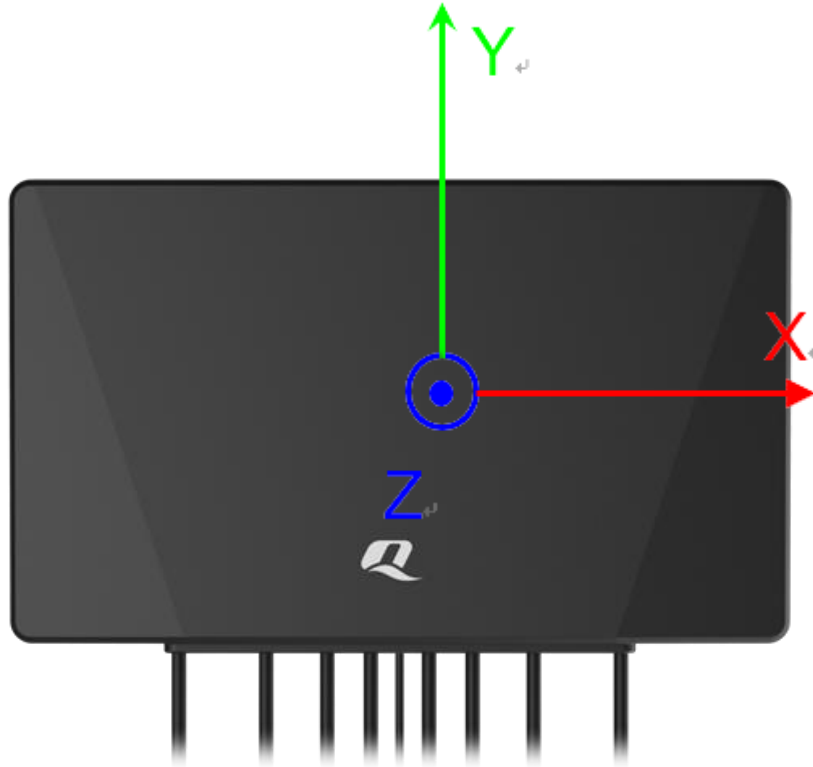




3.2.5. 3D & 2D Radiation Pattern

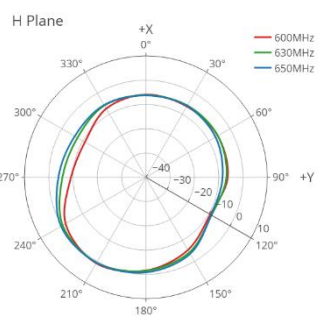
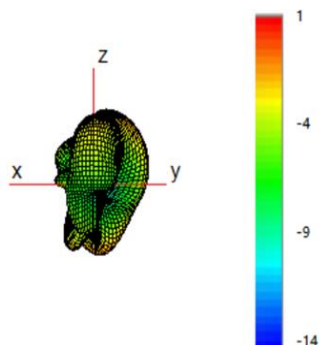
3.2.5.1. Test Condition: In Free Space

- Test Chamber: HF-G-1

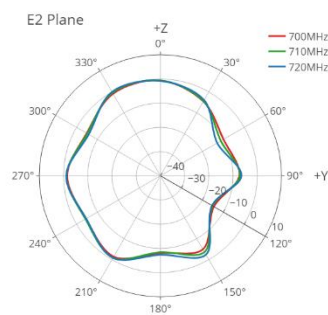
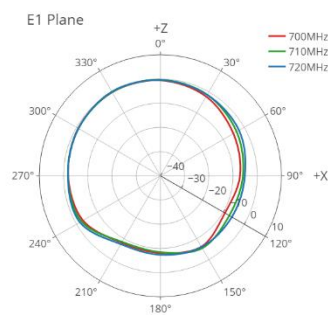
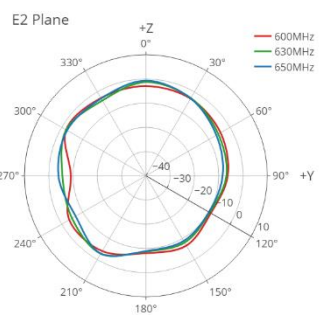
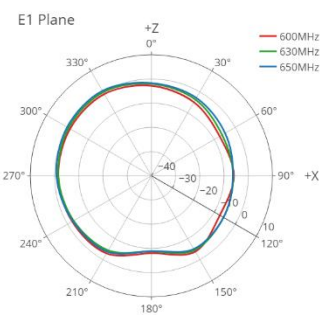
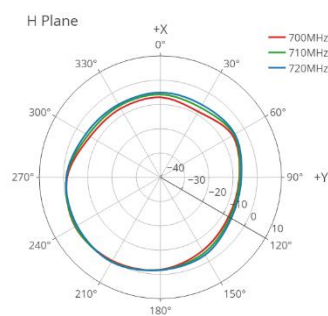
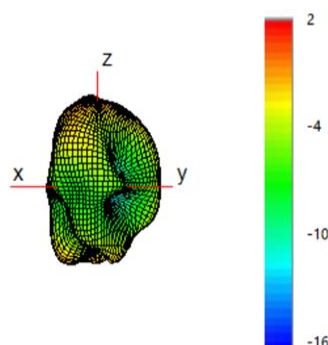


● **LMH1**

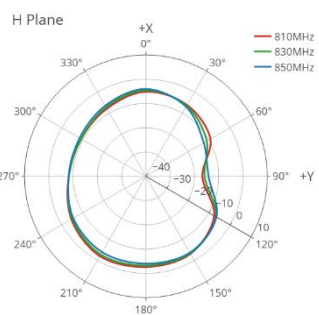
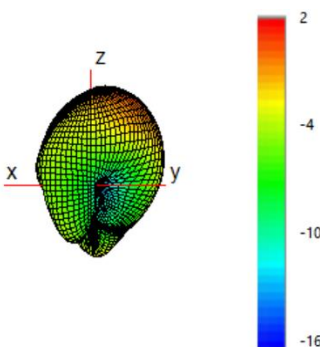
630 MHz



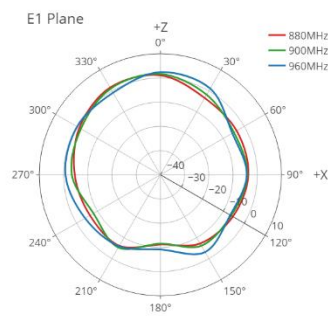
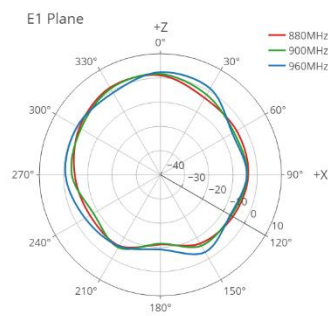
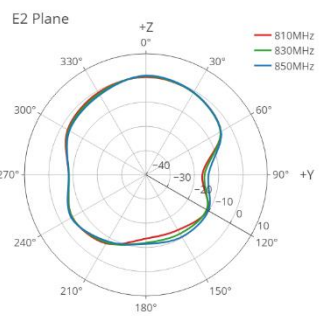
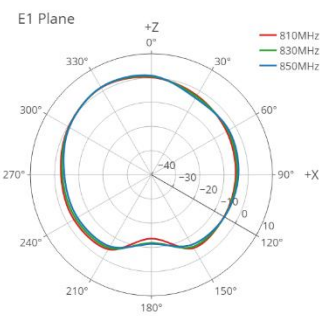
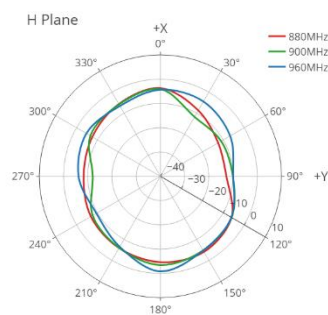
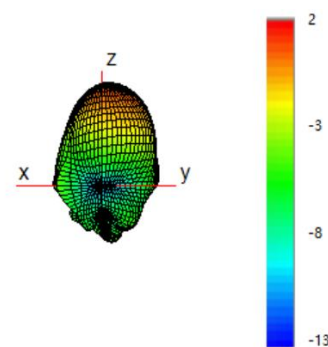
710 MHz



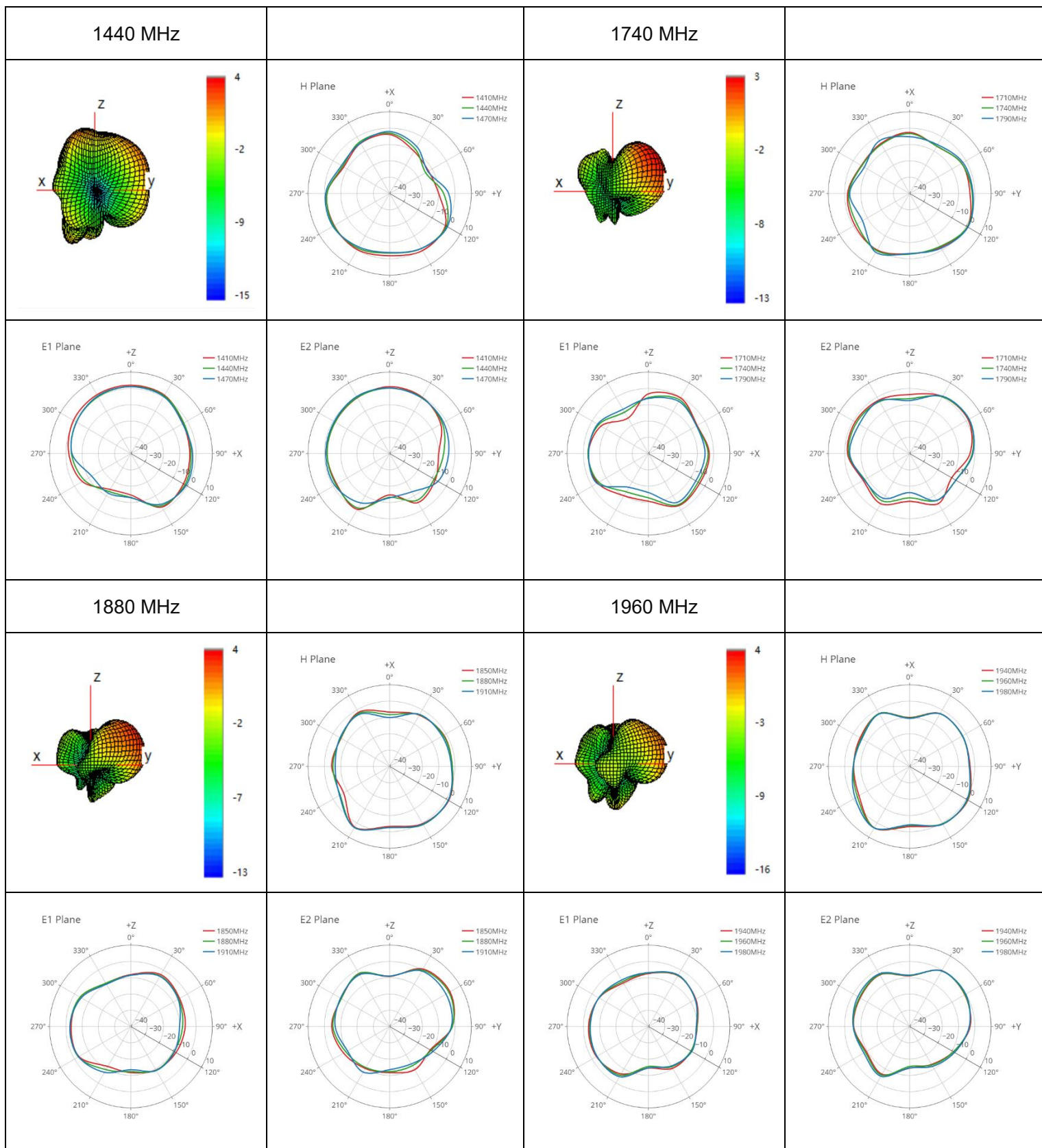
830 MHz



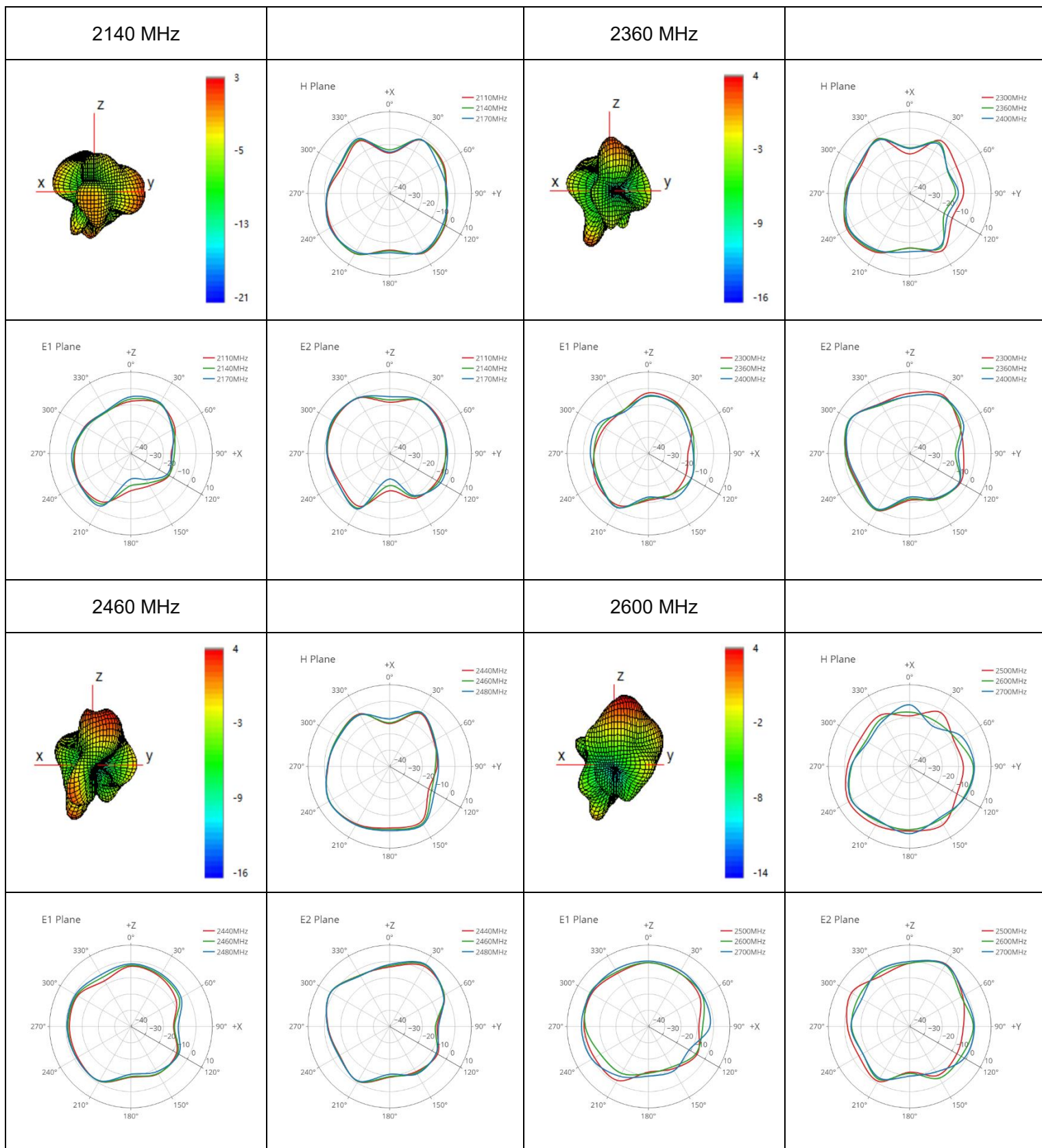
900 MHz



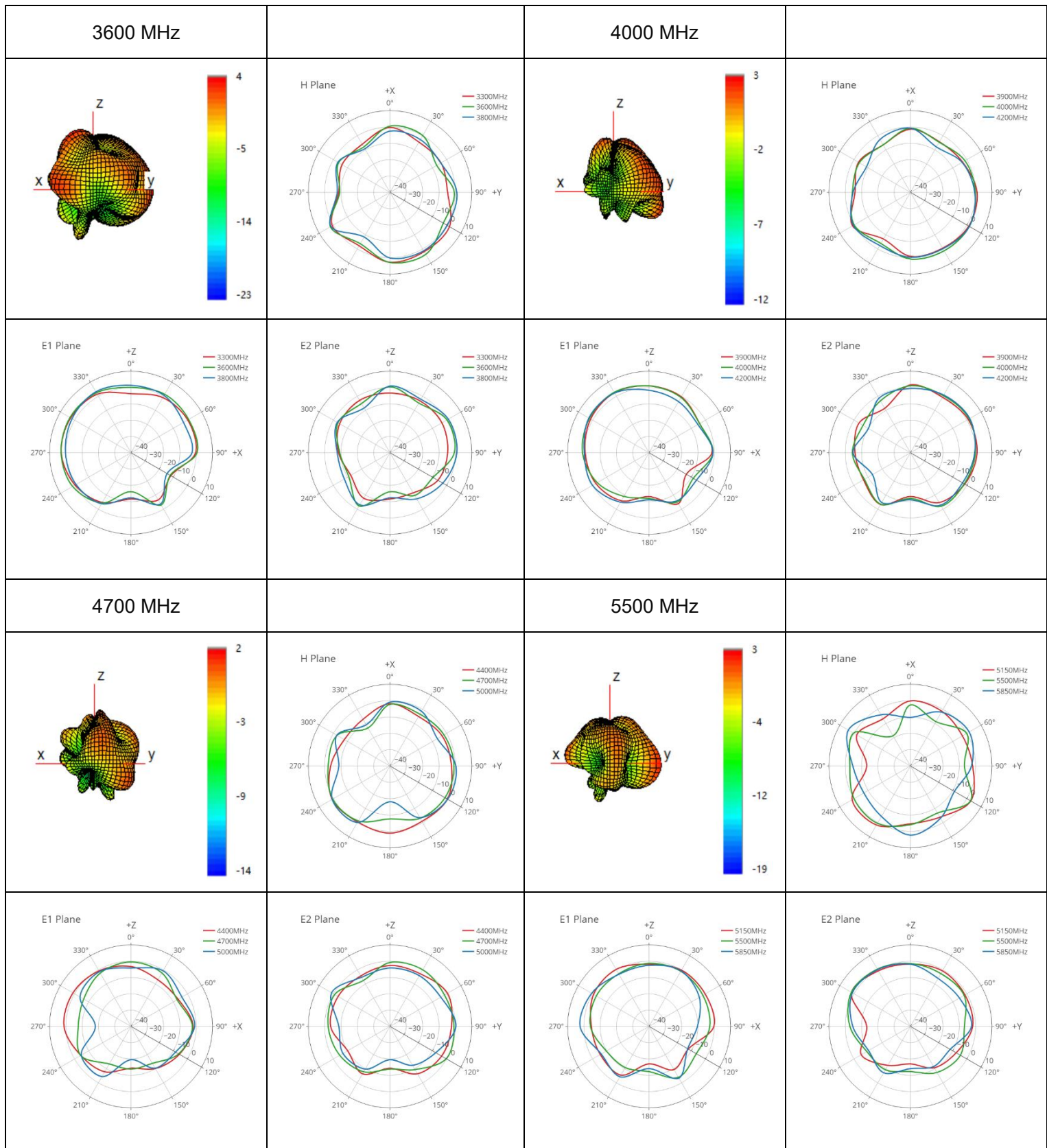
● **LMH1**



● **LMH1**

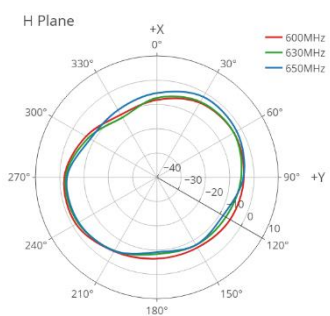
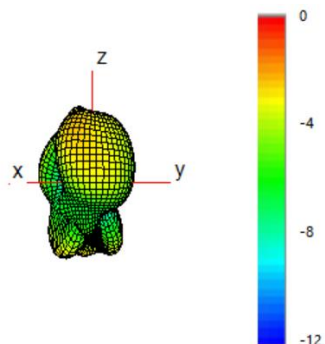


● **LMH1**

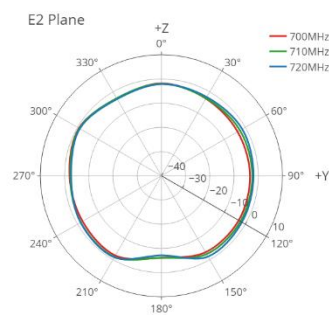
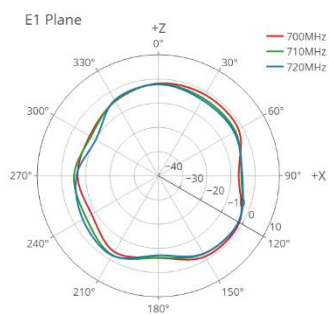
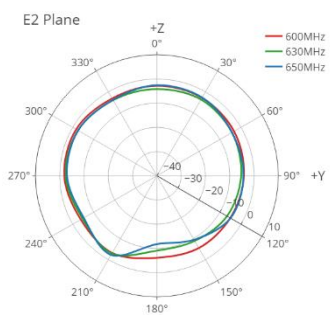
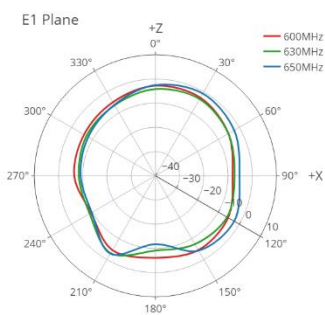
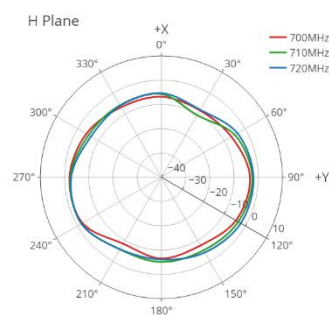
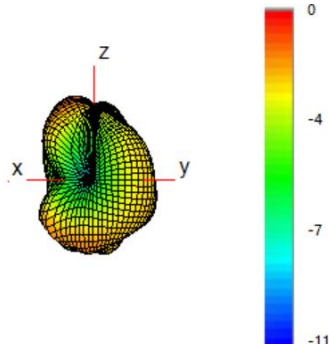


● **LMH2**

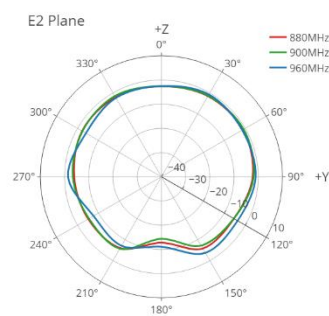
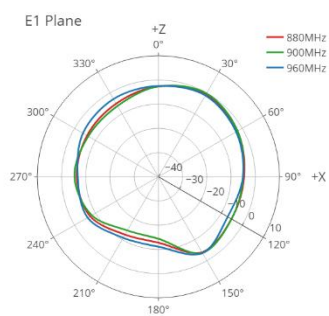
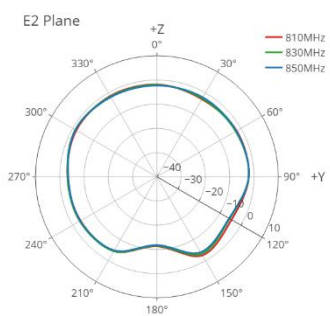
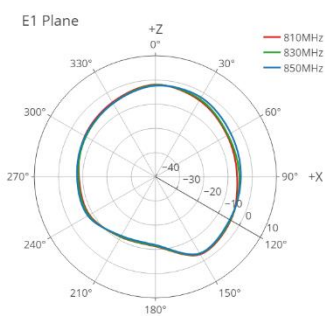
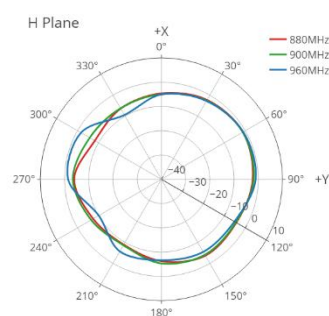
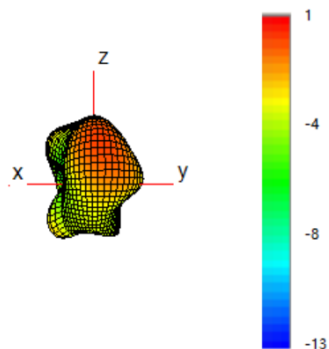
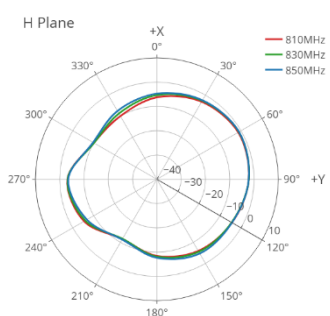
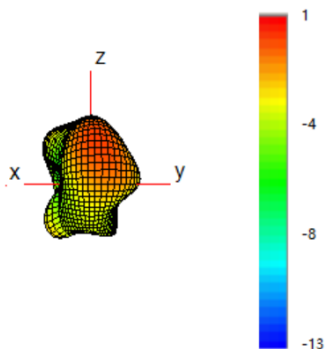
630 MHz



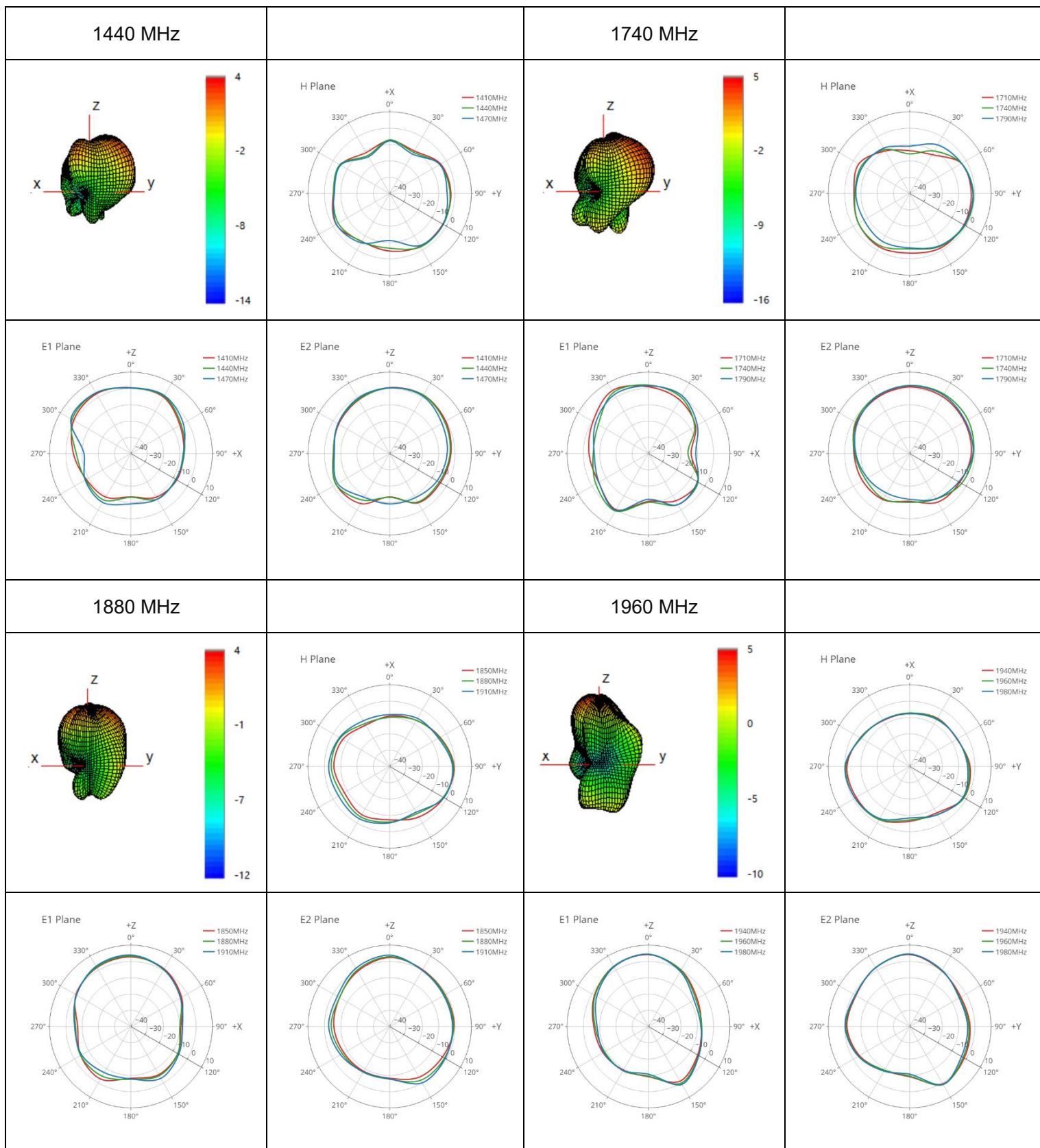
710 MHz



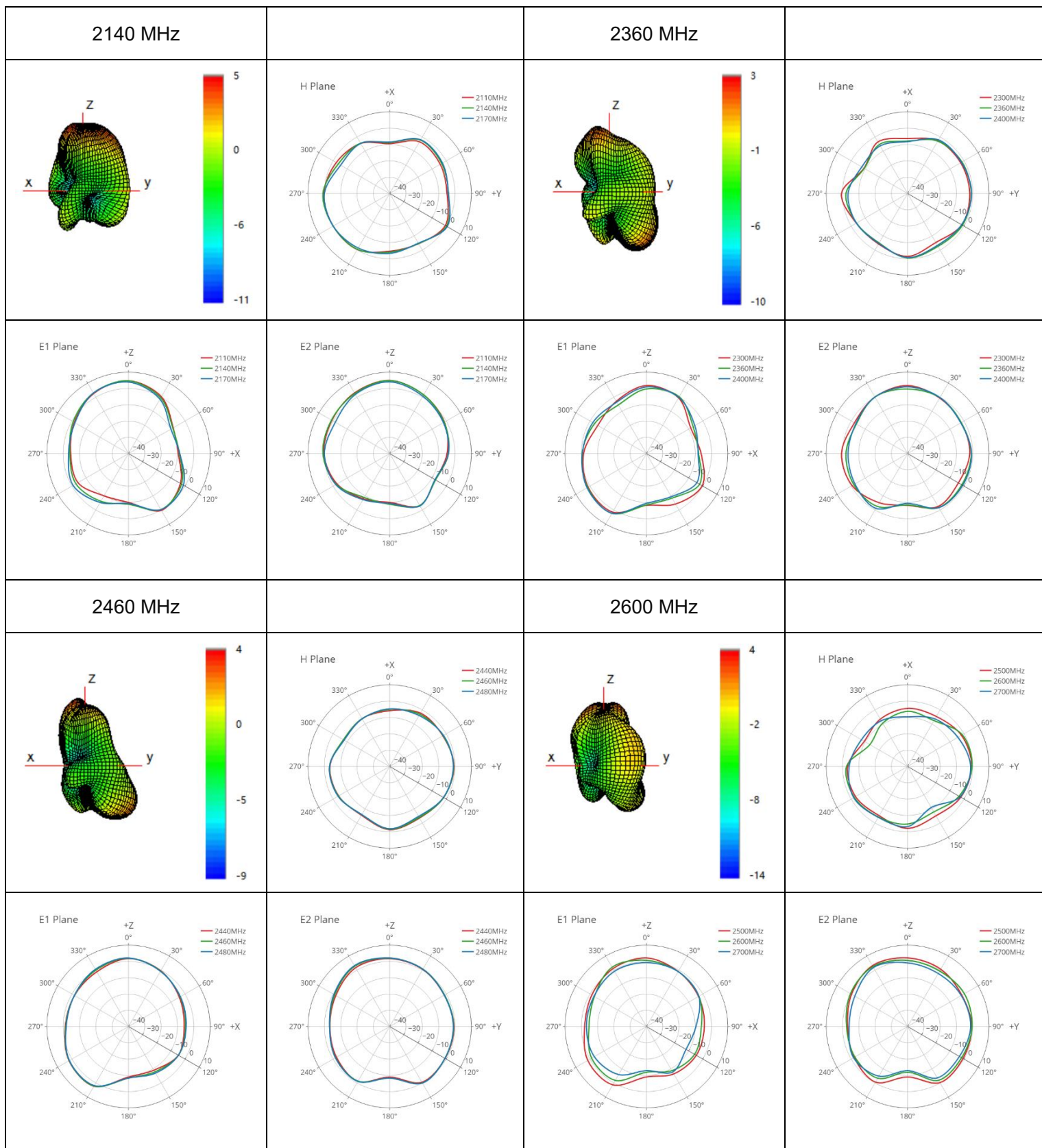
830 MHz



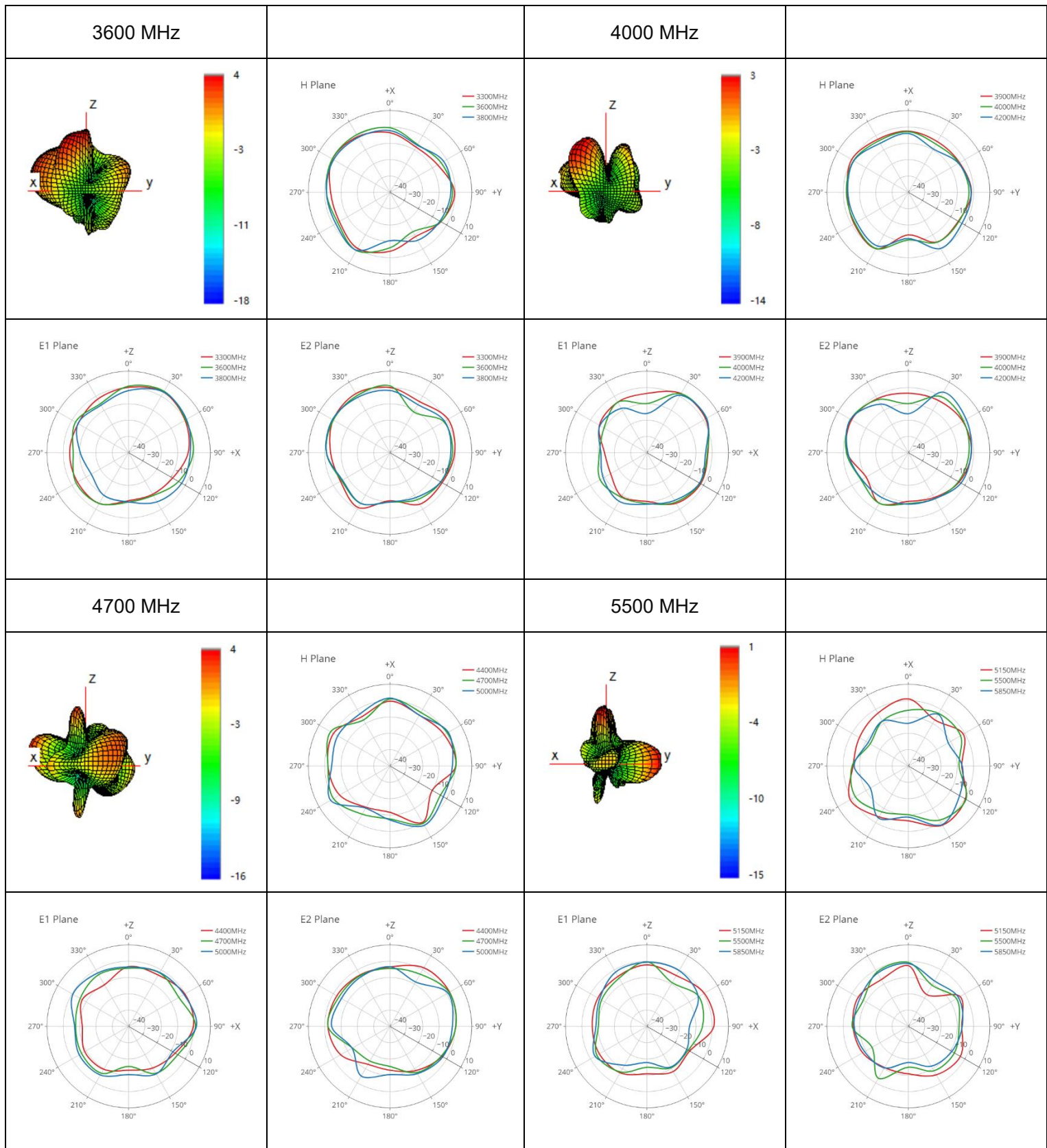
● **LMH2**



● **LMH2**

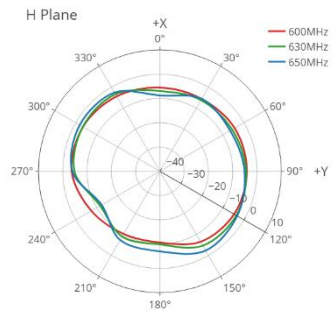
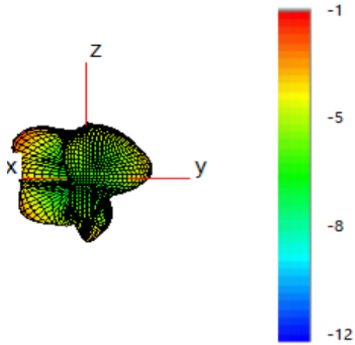


● **LMH2**

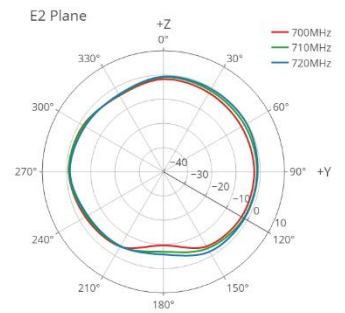
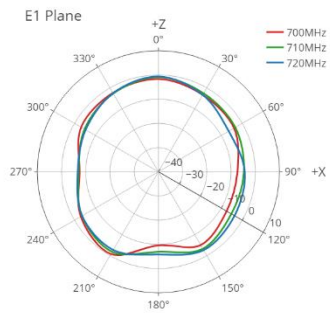
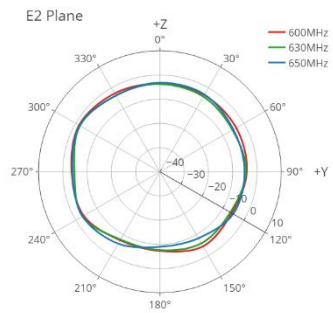
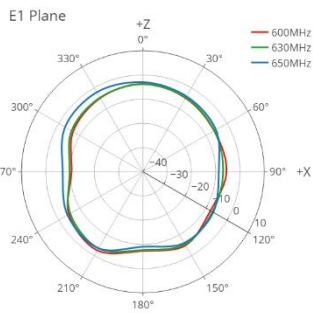
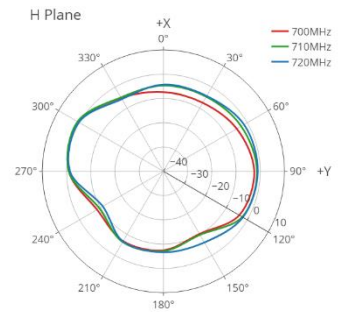
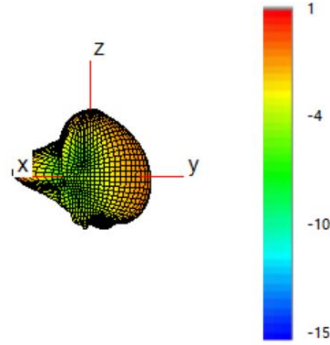


● **LMH3**

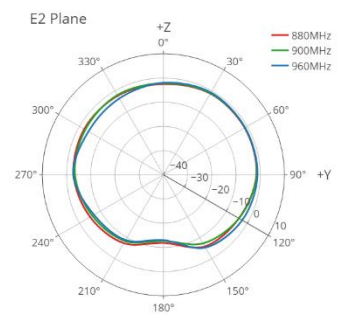
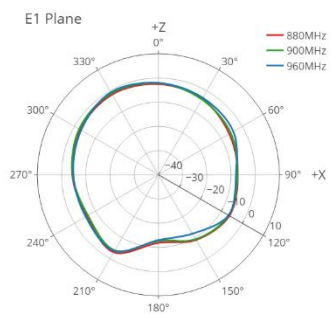
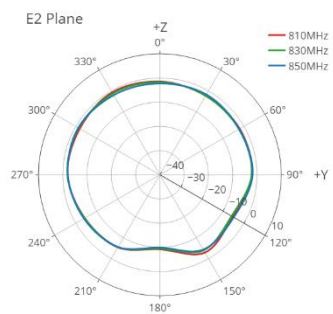
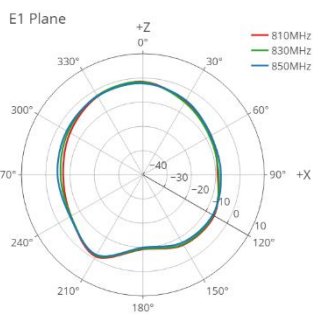
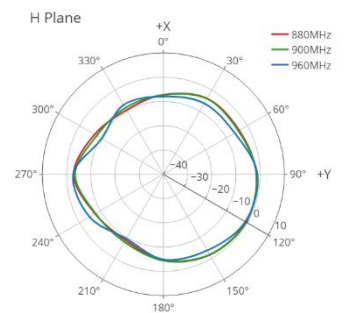
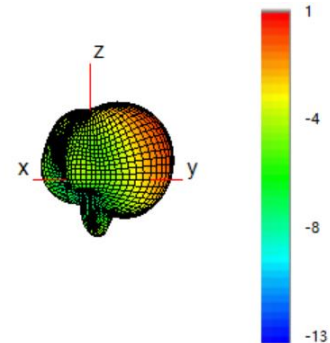
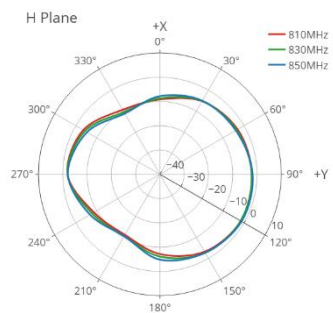
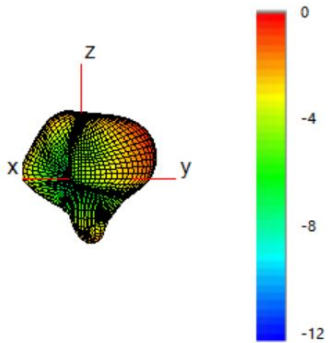
630 MHz



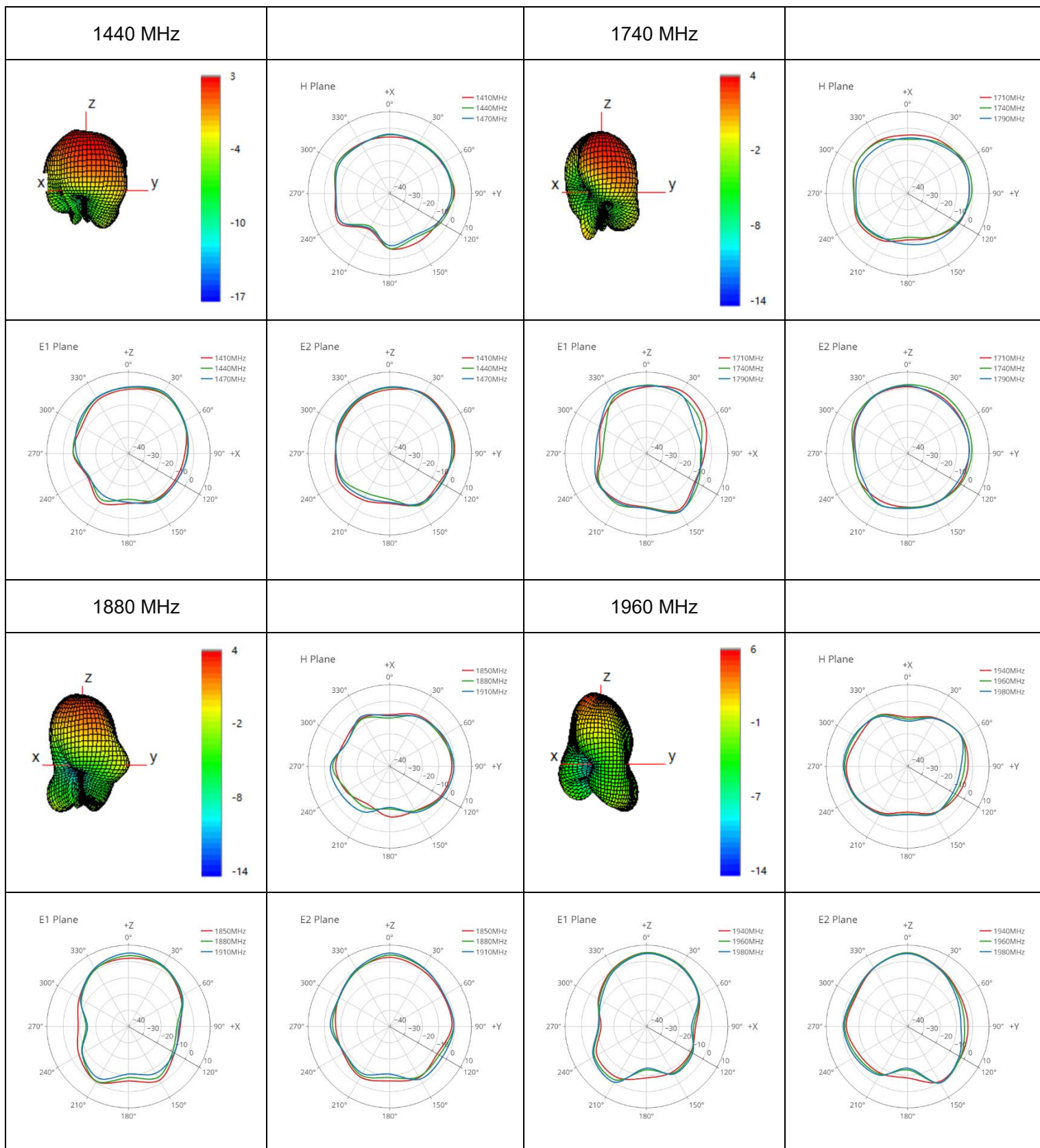
710 MHz



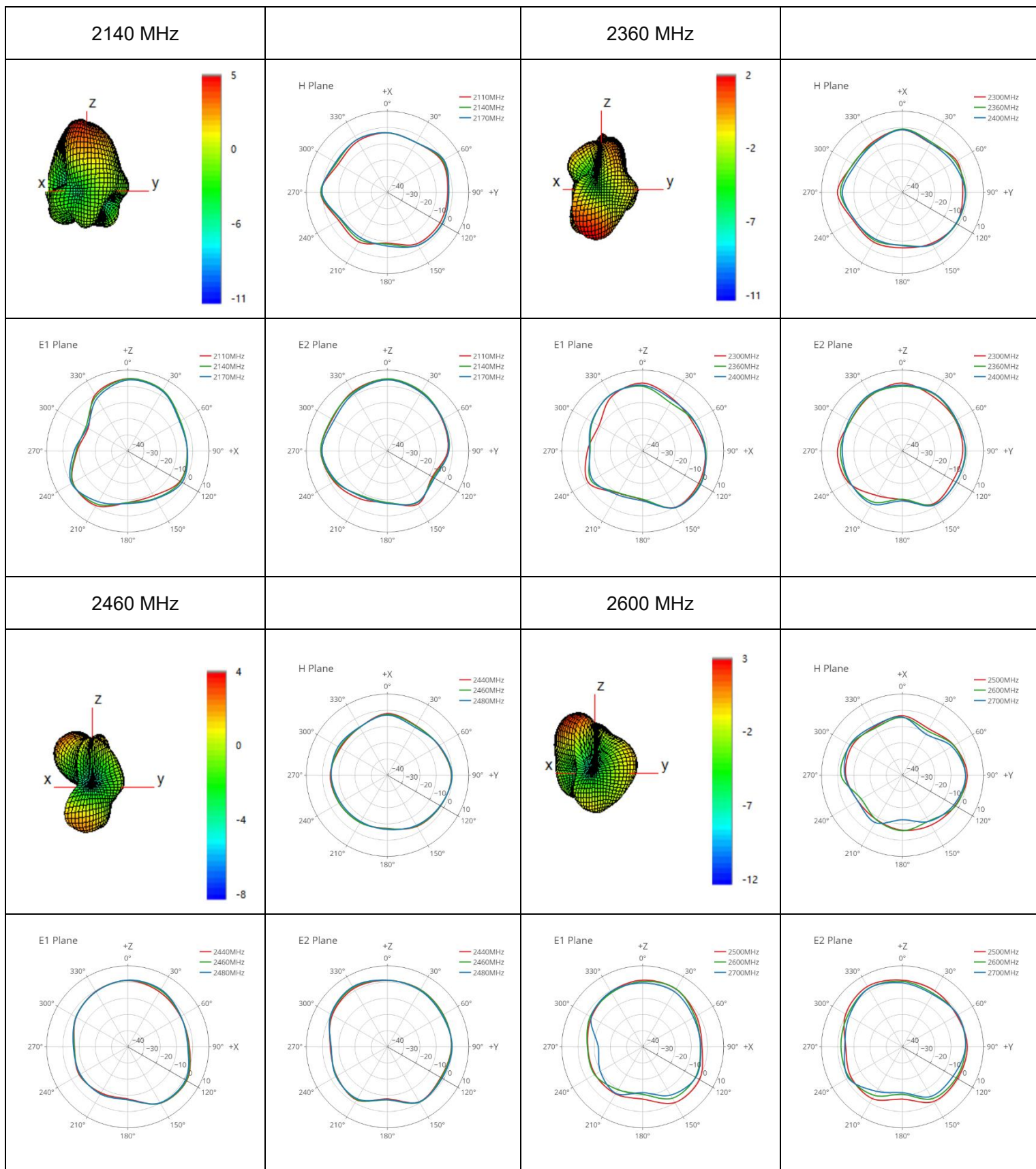
830 MHz



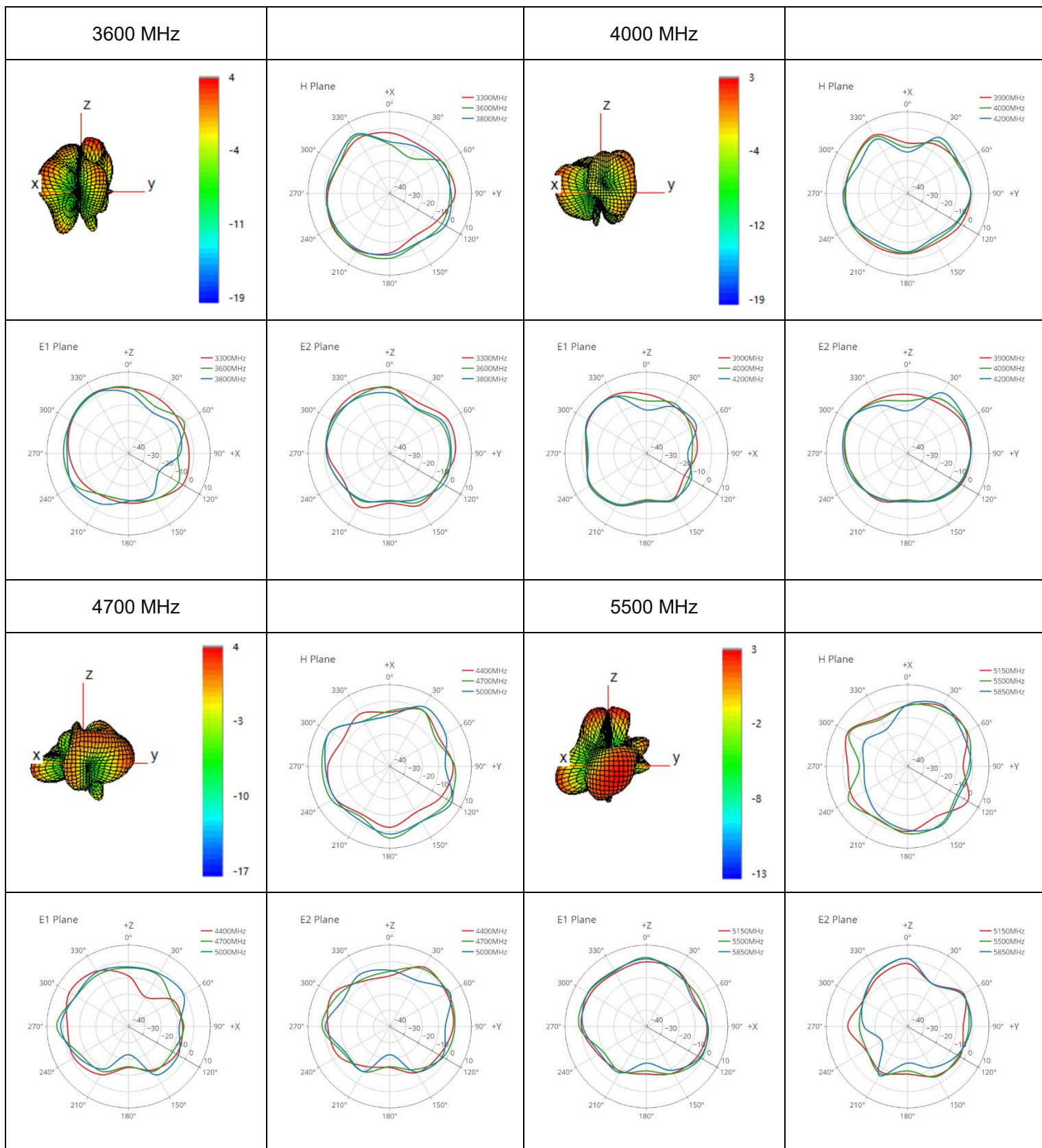
● **LMH3**



● **LMH3**

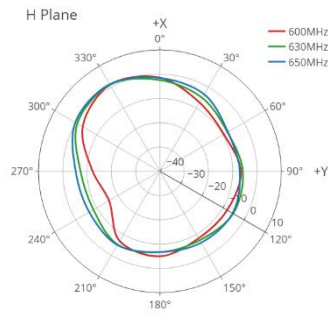
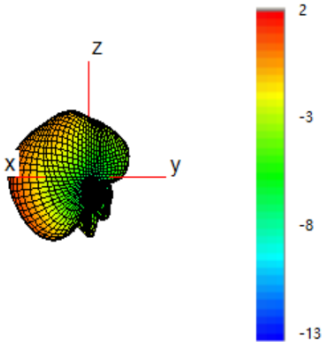


● **LMH3**

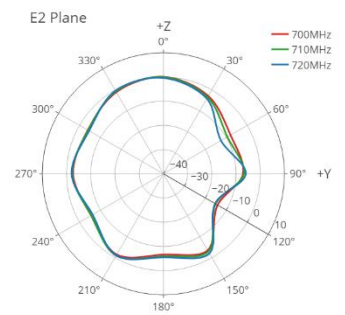
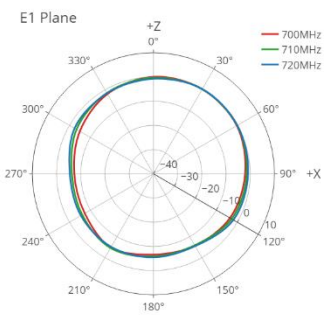
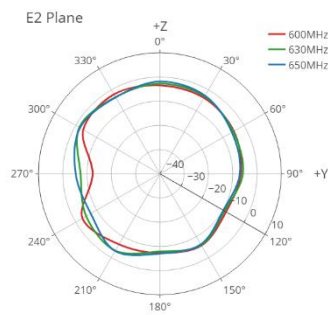
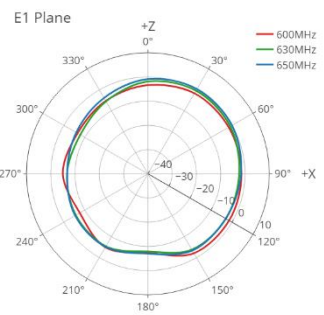
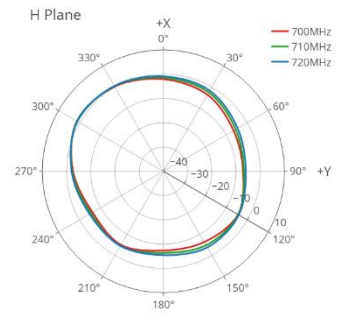
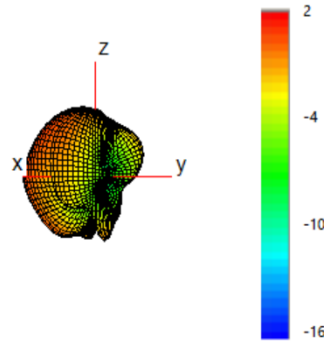


● **LMH4**

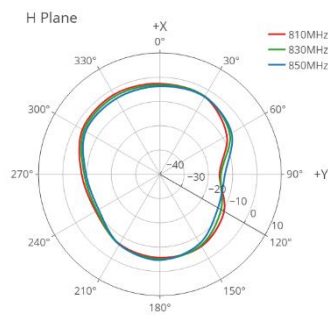
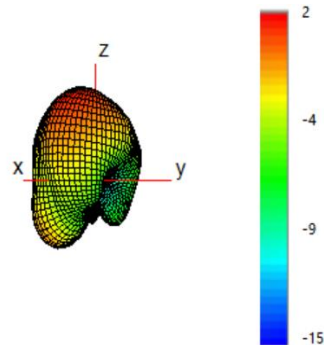
630 MHz



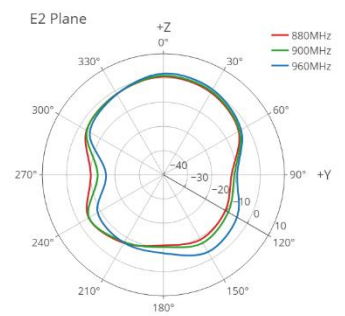
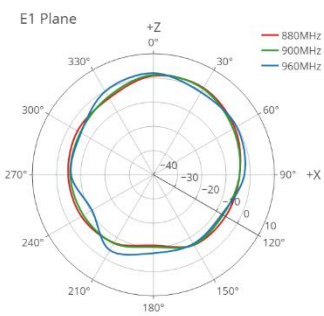
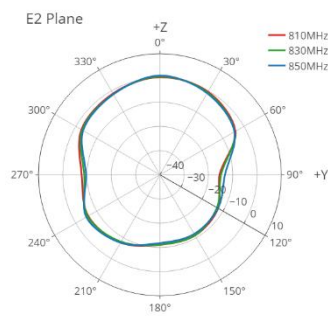
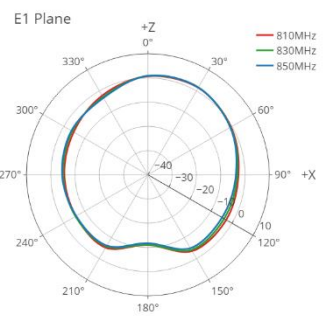
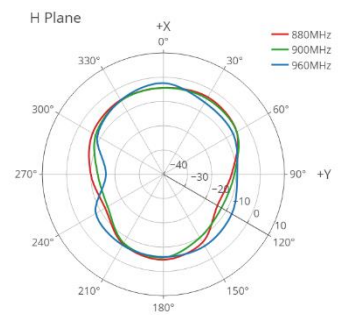
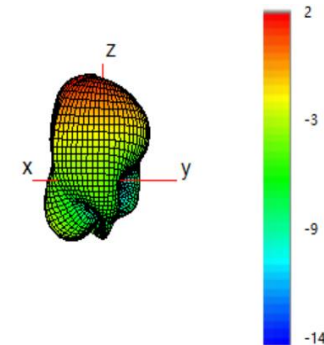
710 MHz



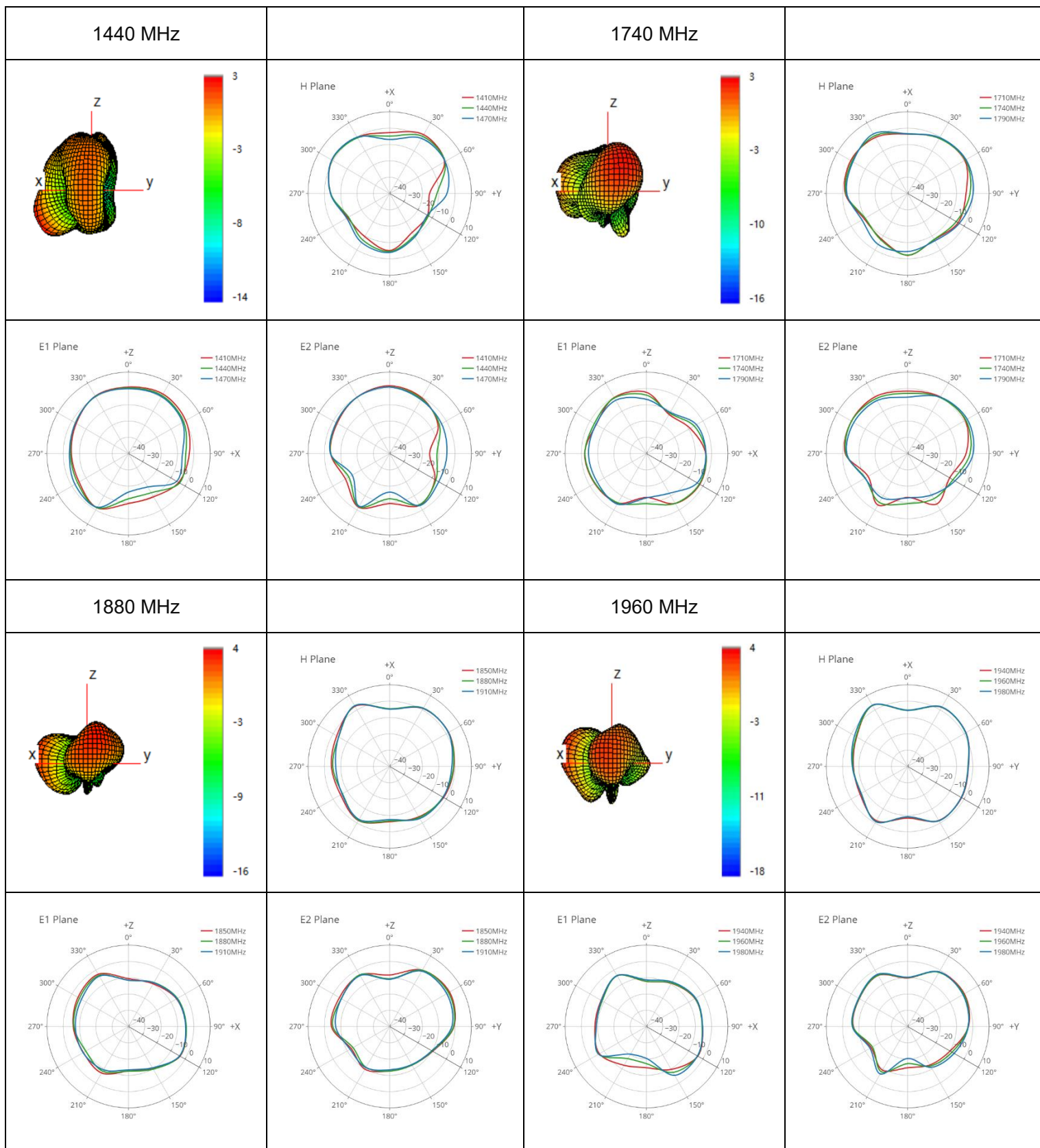
830 MHz



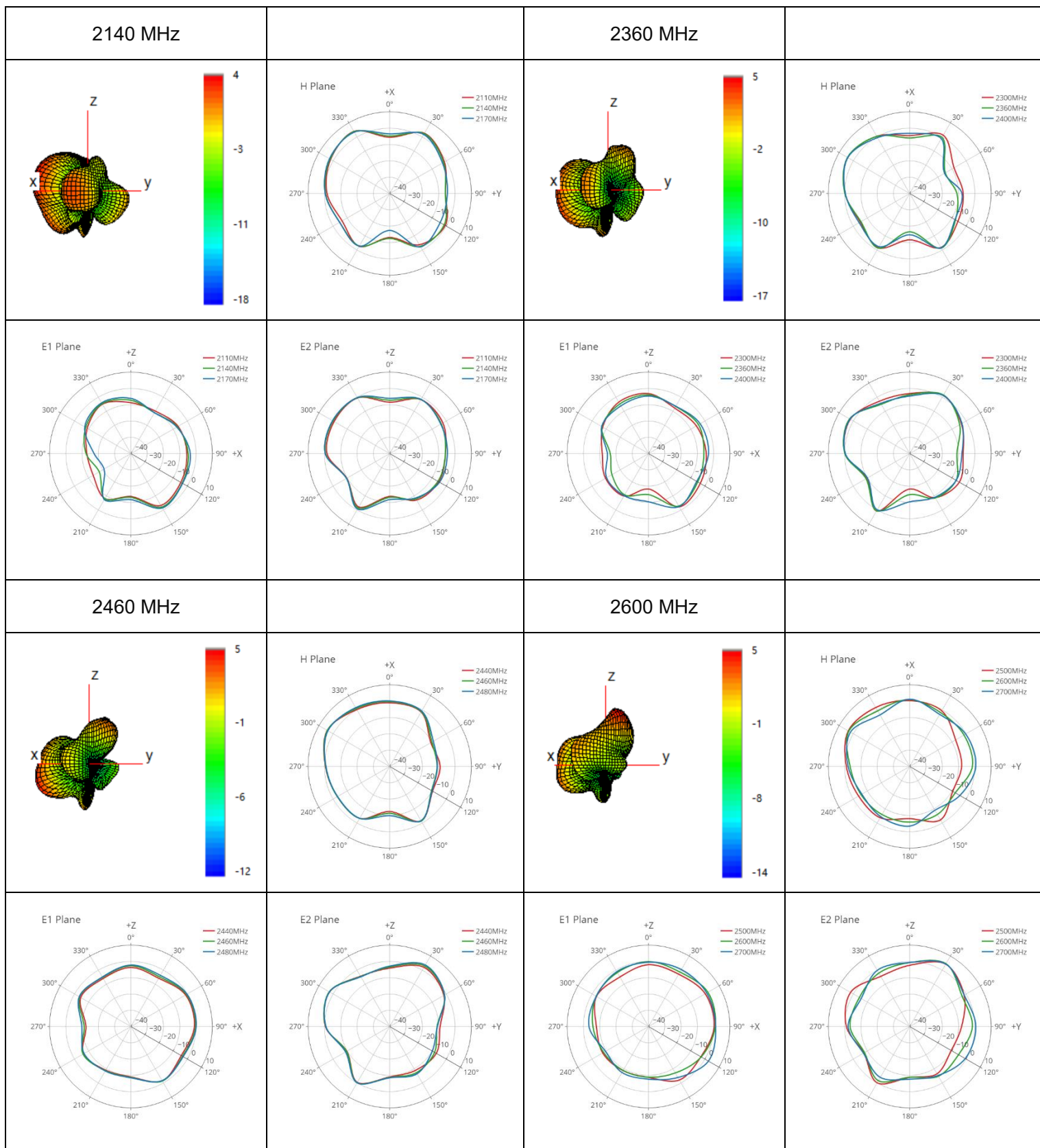
900 MHz



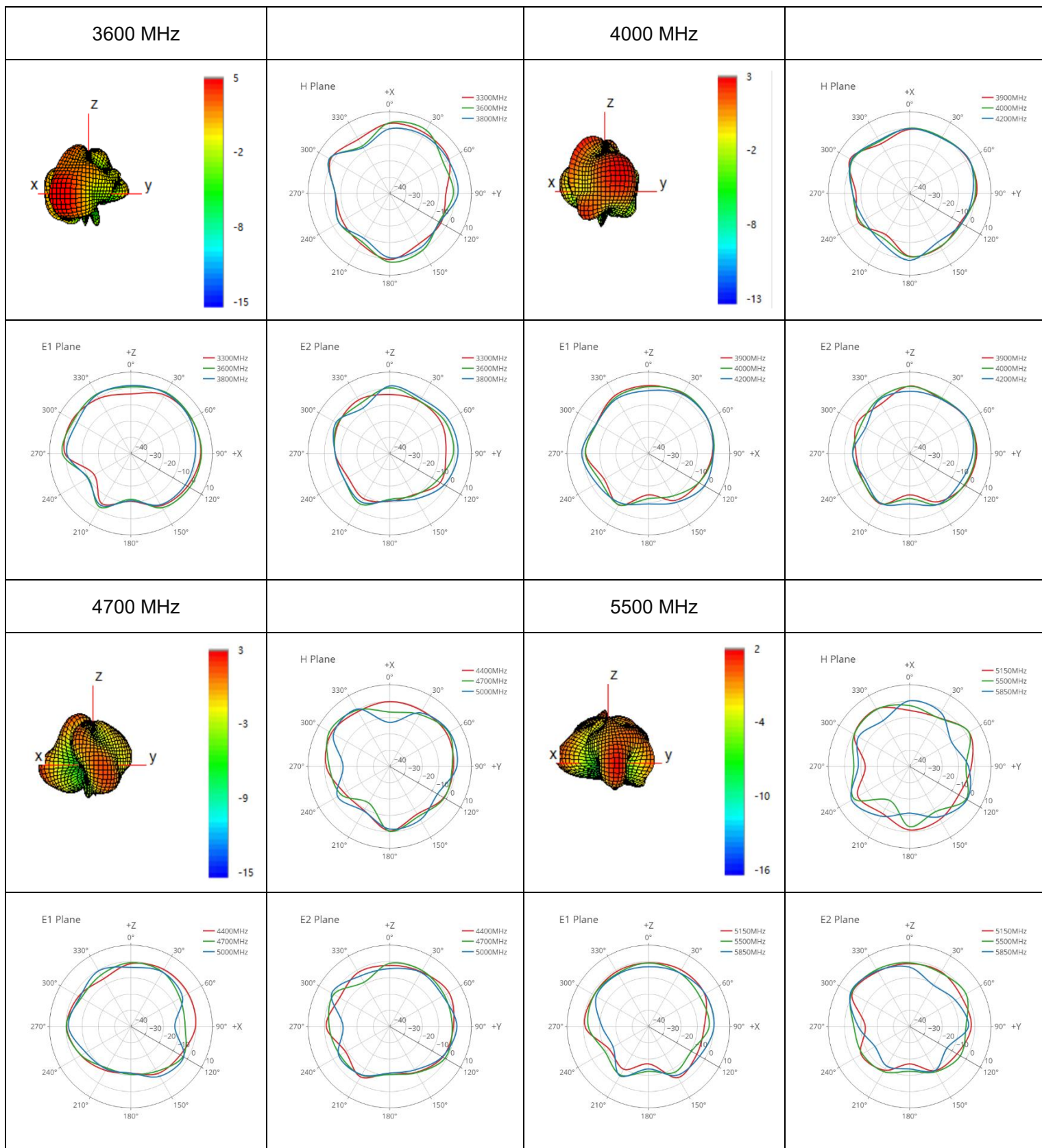
● **LMH4**



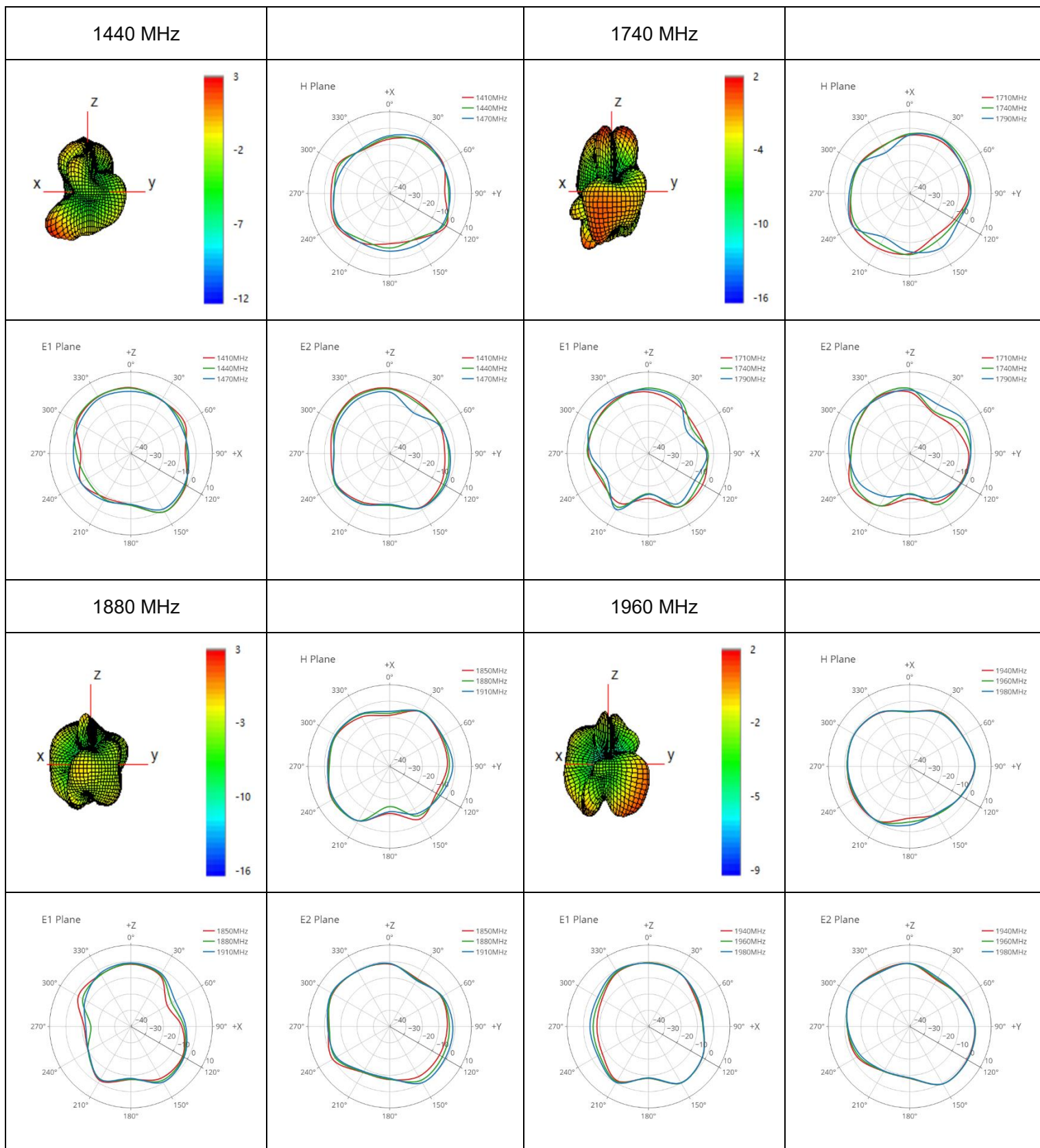
● **LMH4**



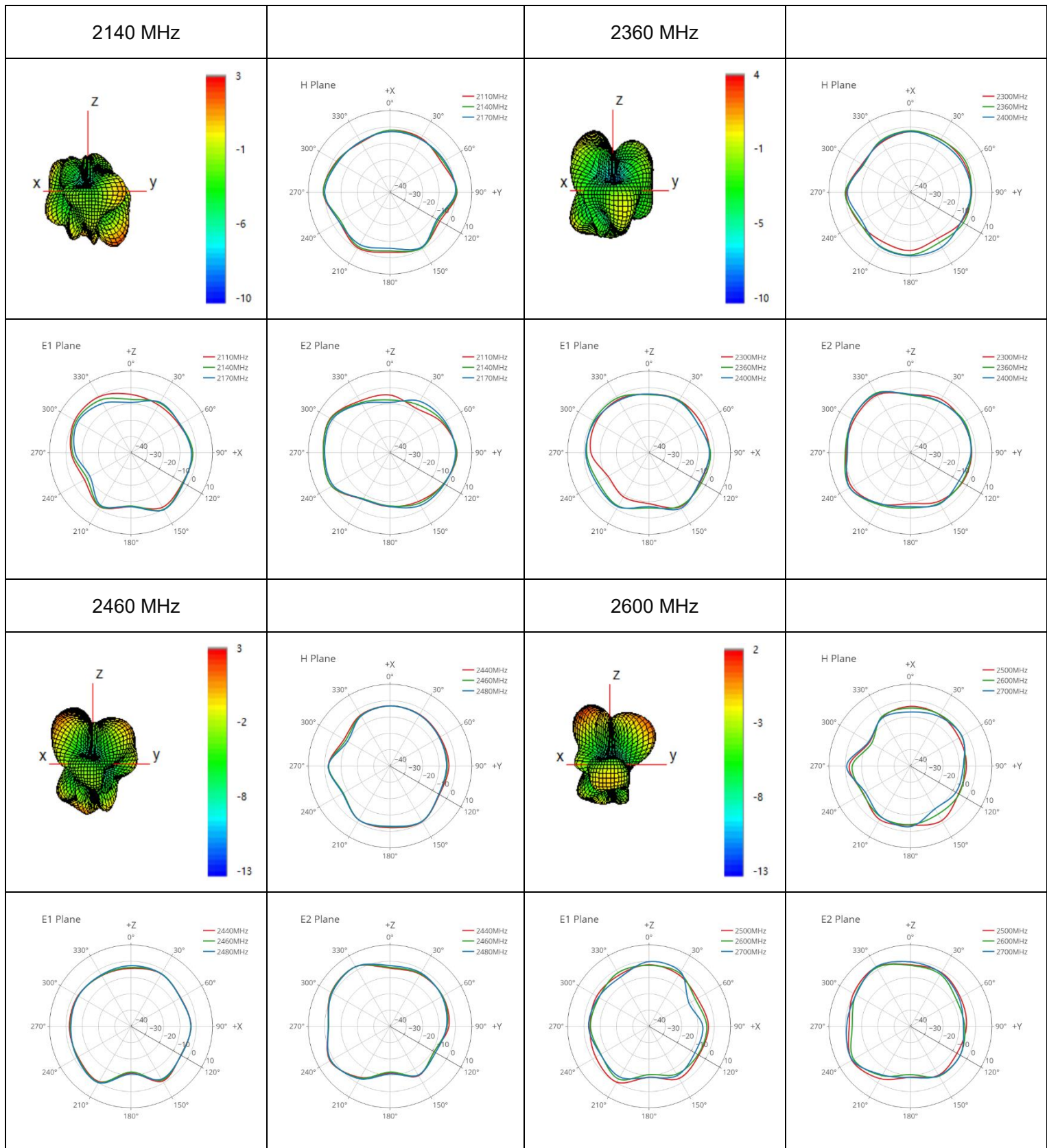
● **LMH4**



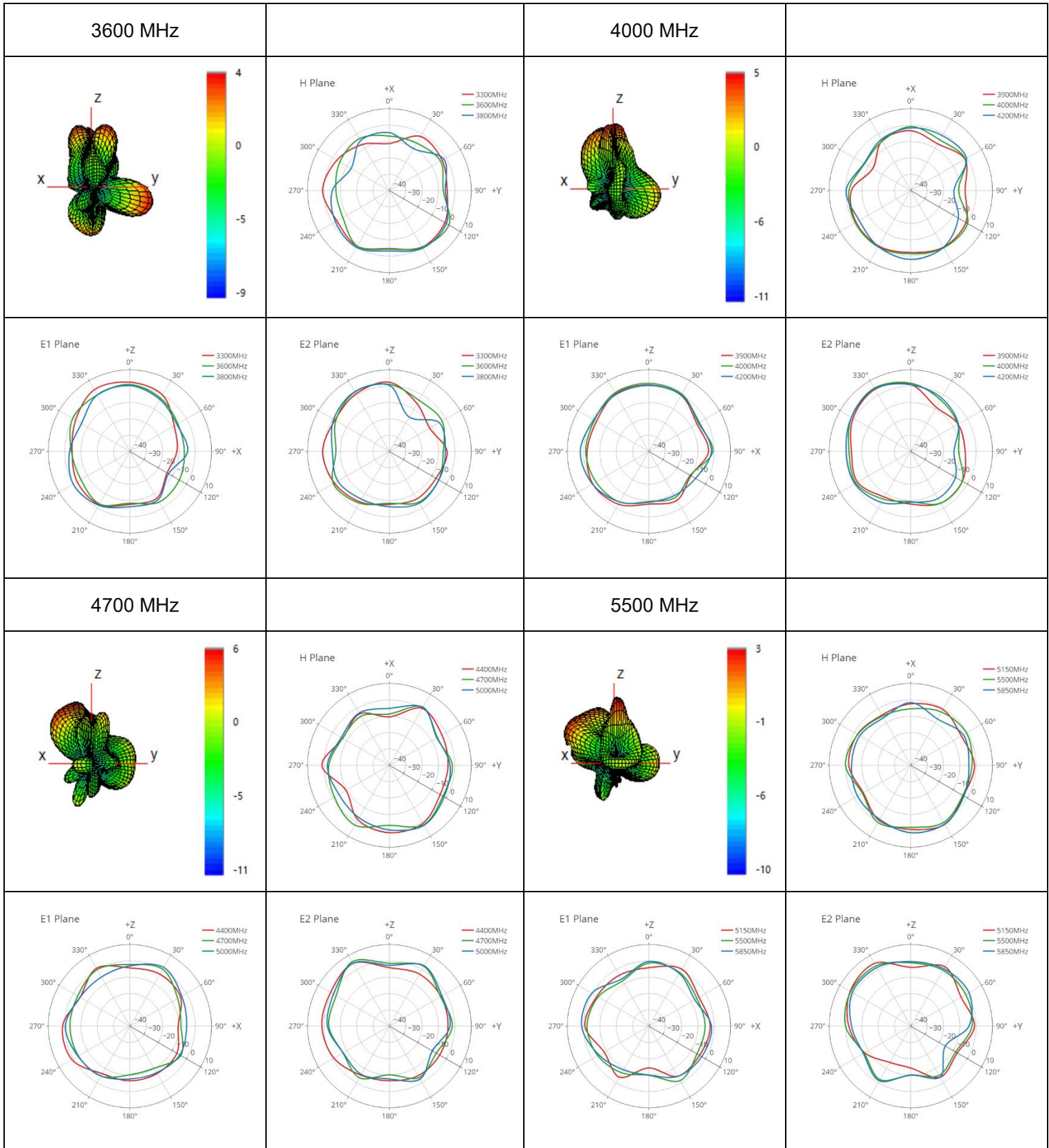
● **MH1**



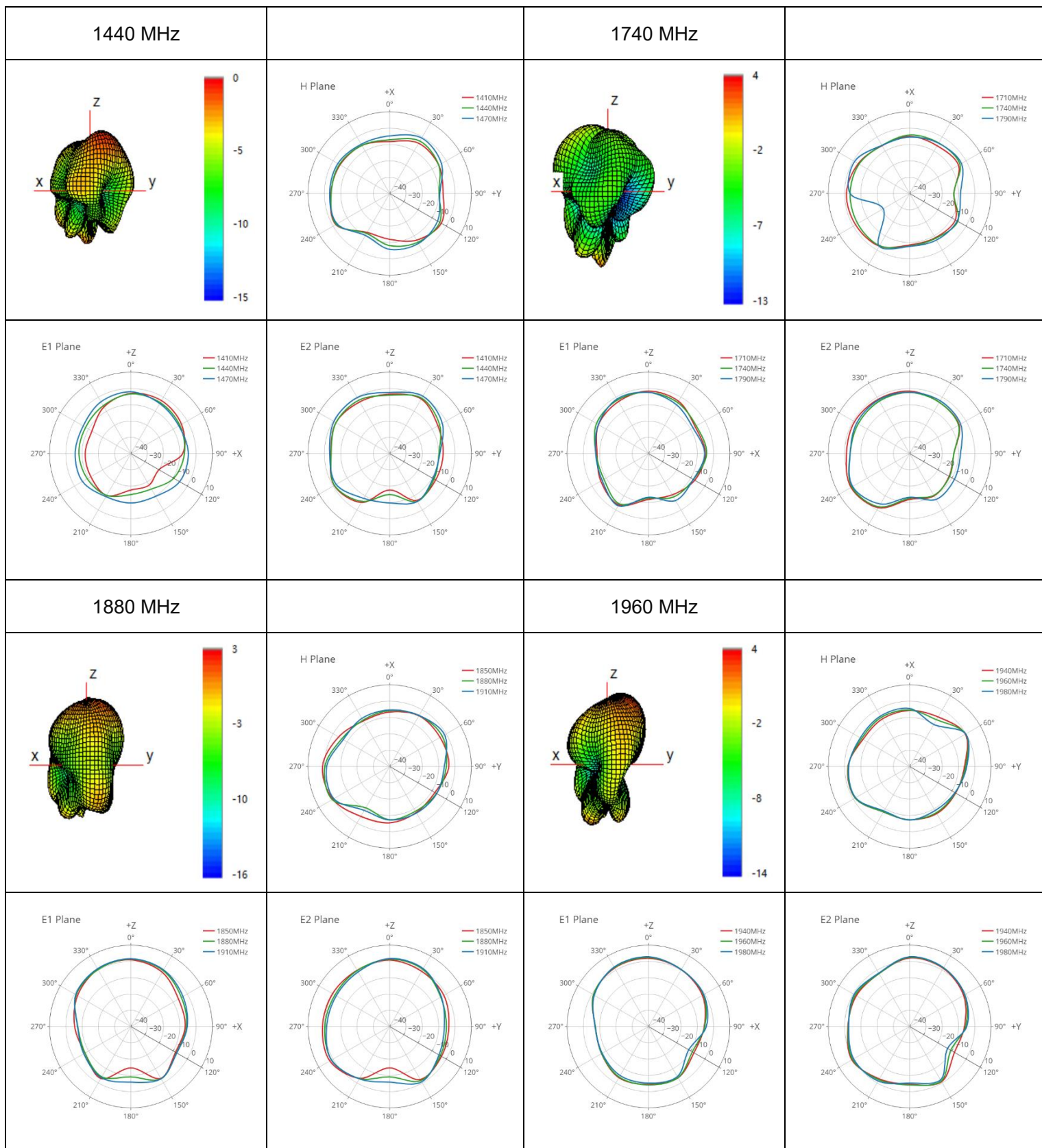
● **MH1**



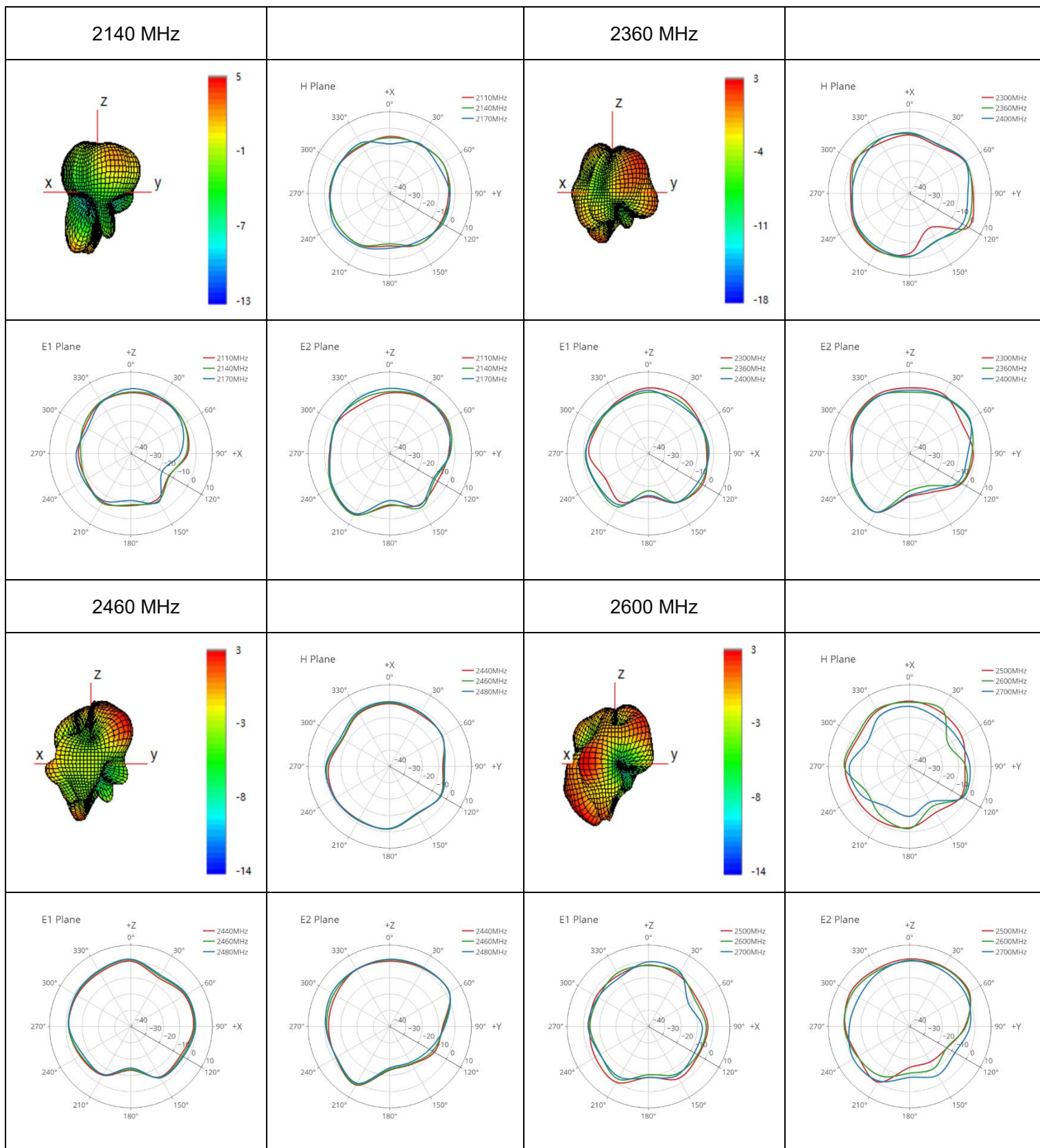
● **MH1**



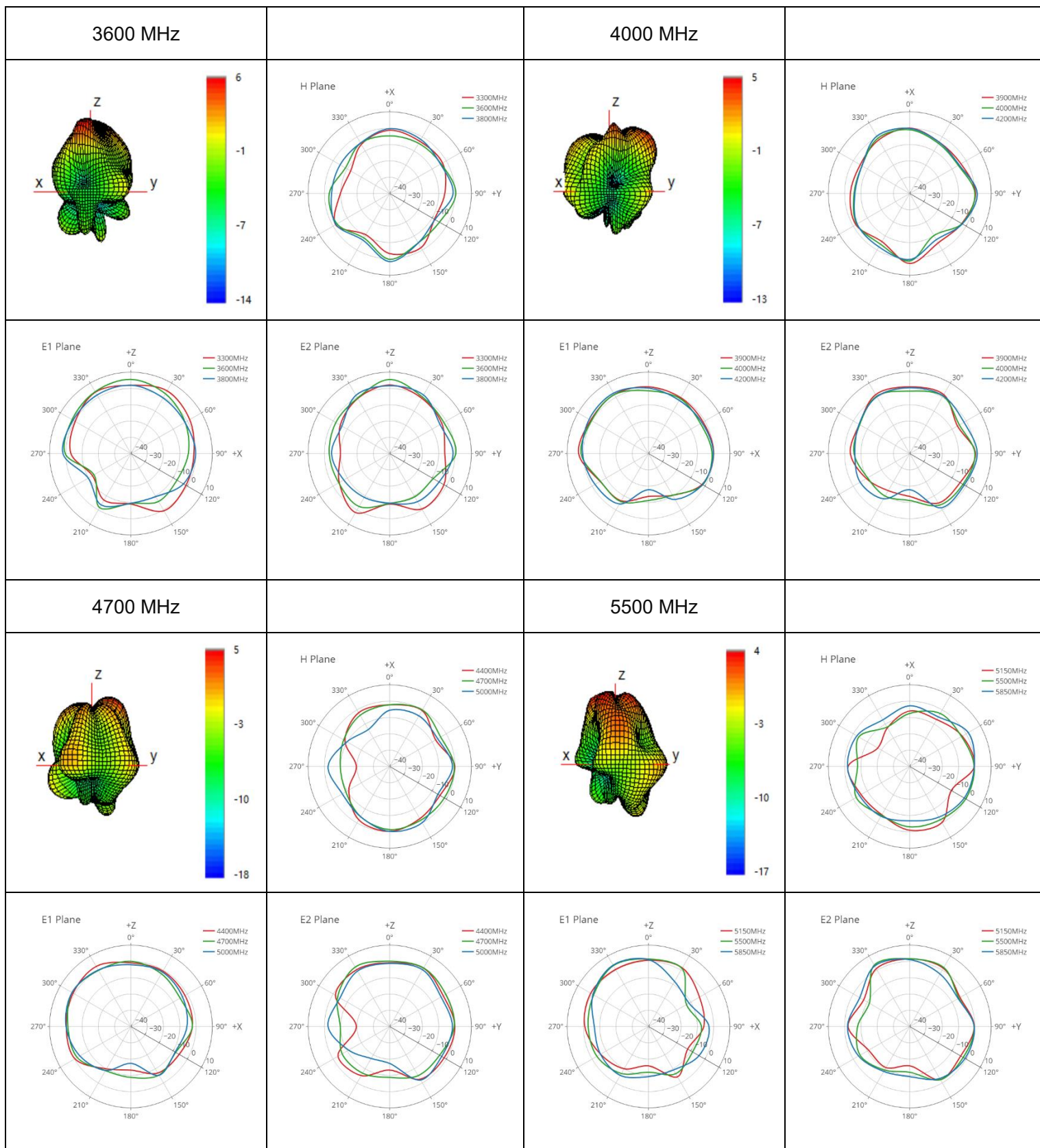
● **MH2**



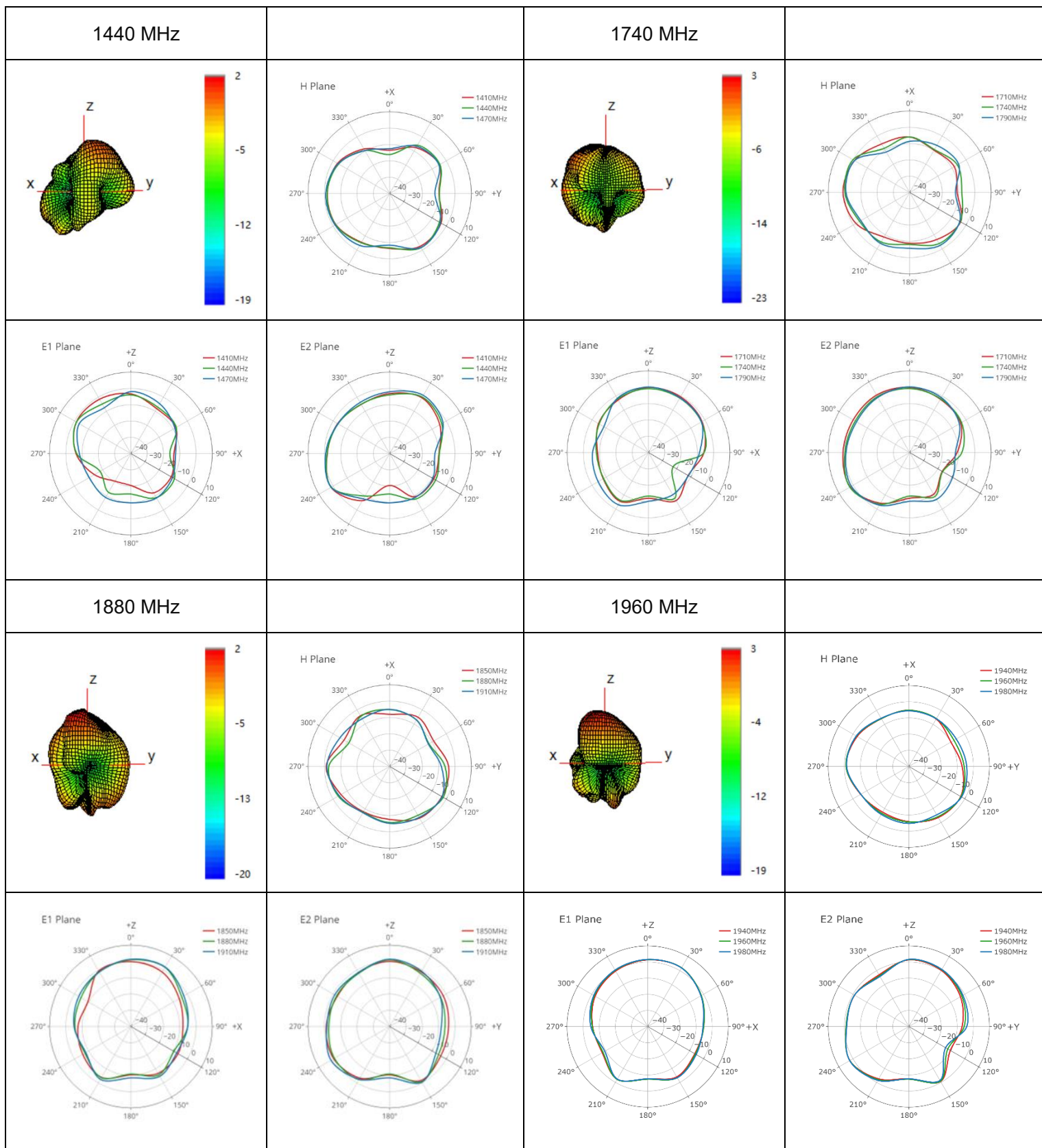
● **MH2**



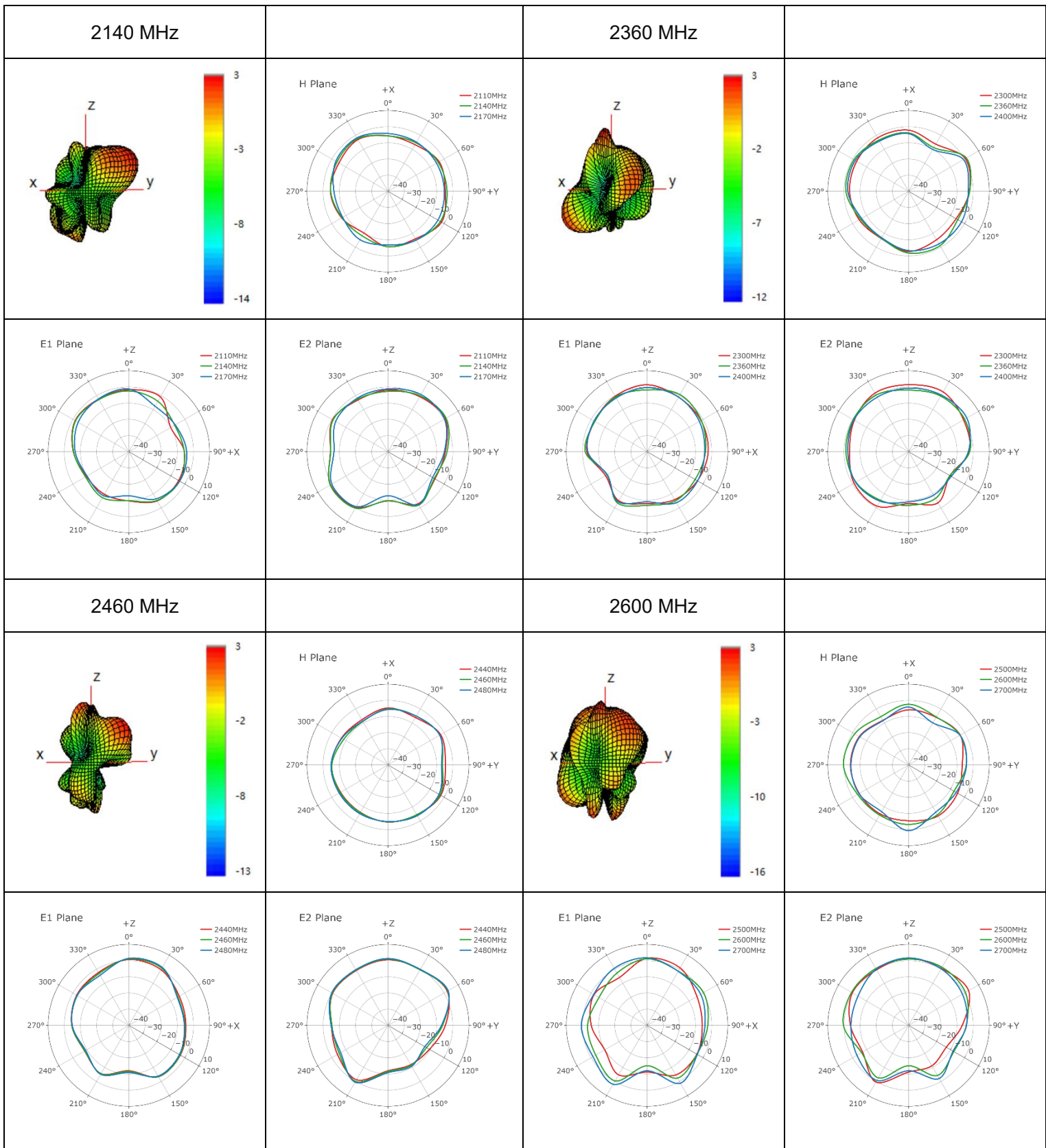
● **MH2**



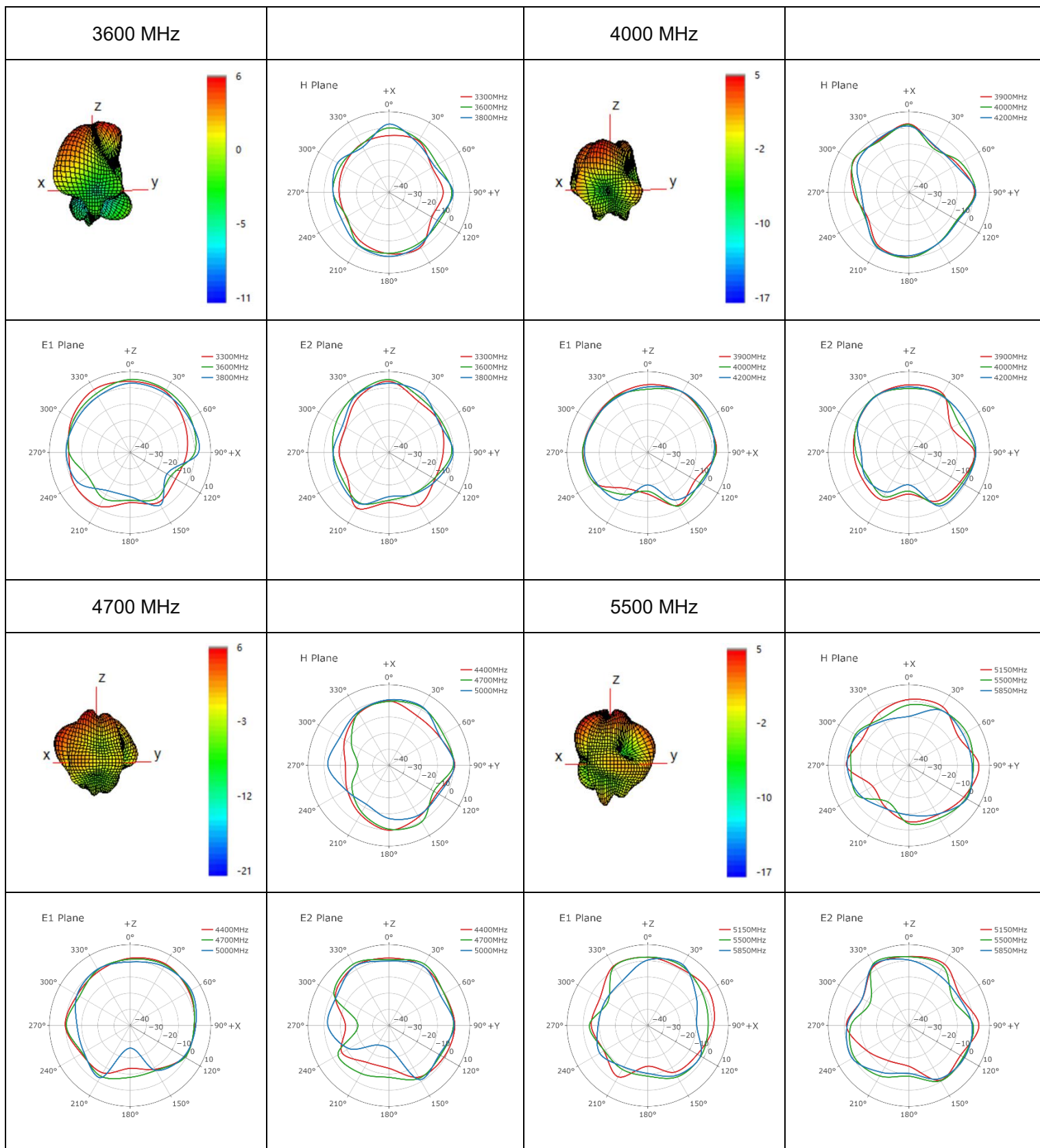
● **MH3**



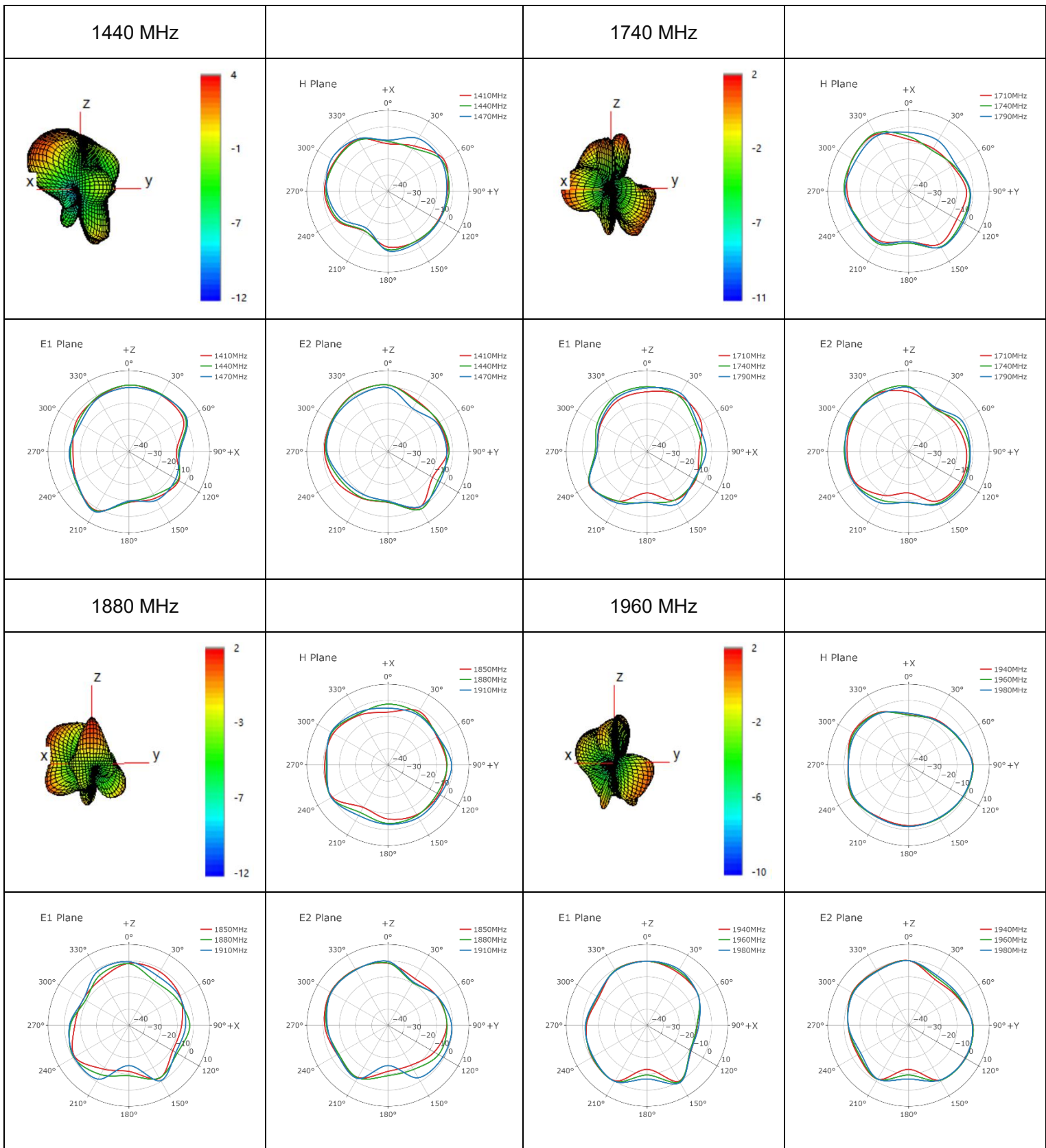
● **MH3**



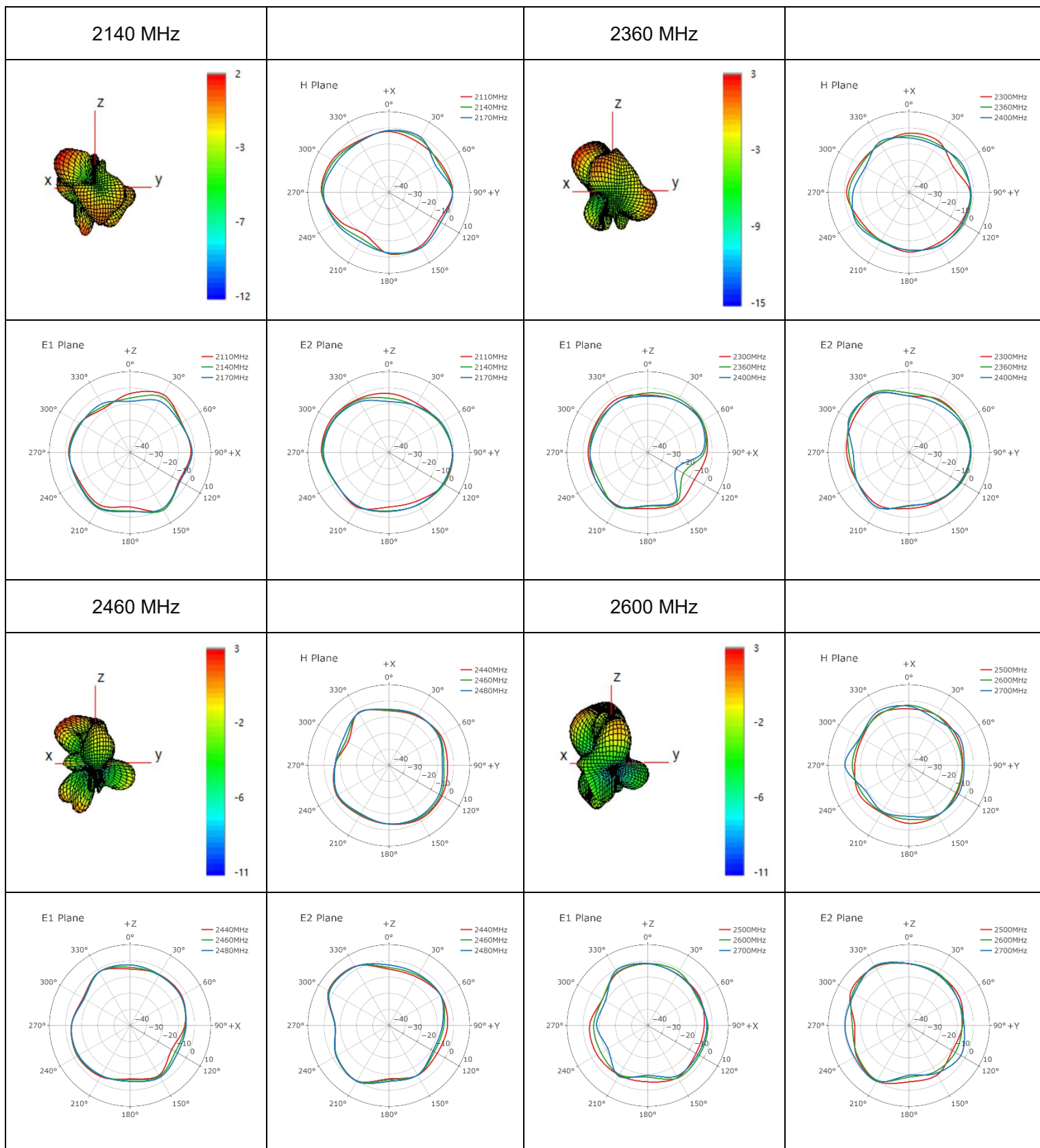
● **MH3**



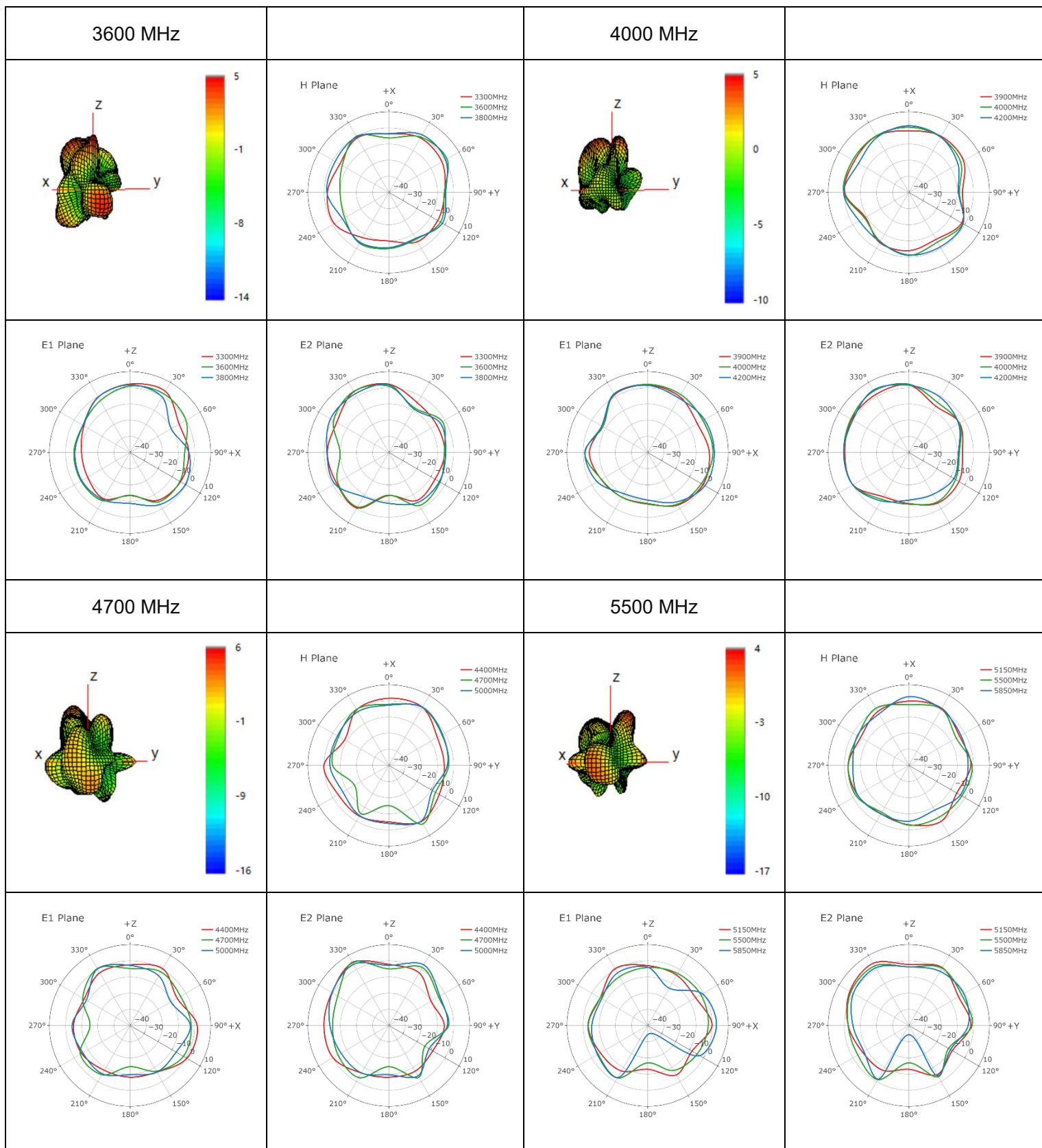
● **MH4**



● **MH4**

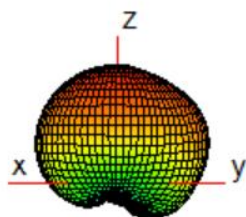


● **MH4**

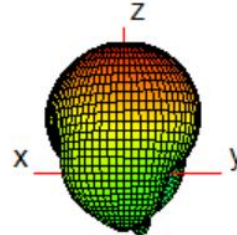


● **GNSS**

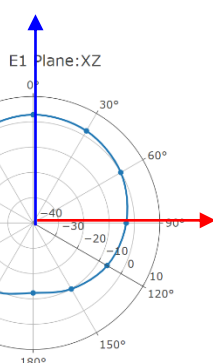
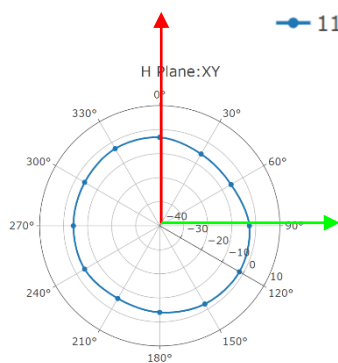
1176 MHz



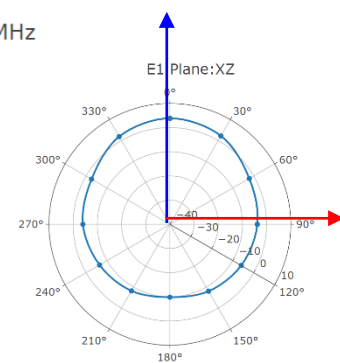
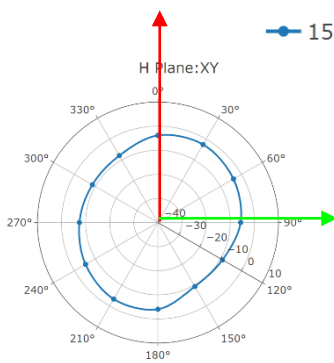
1561 MHz



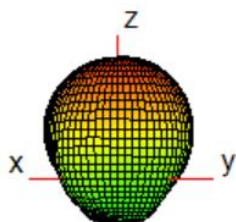
— 1176MHz



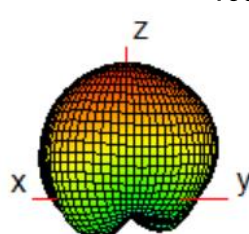
— 1561MHz



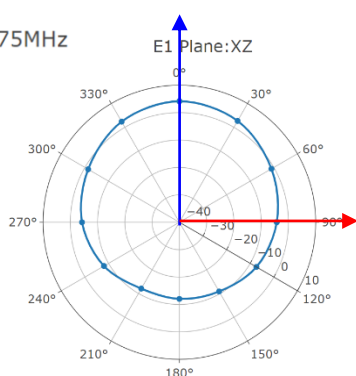
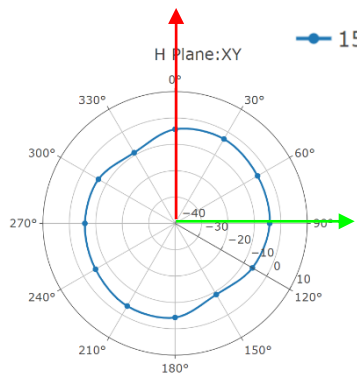
1575 MHz



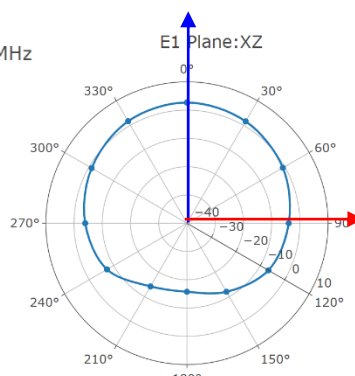
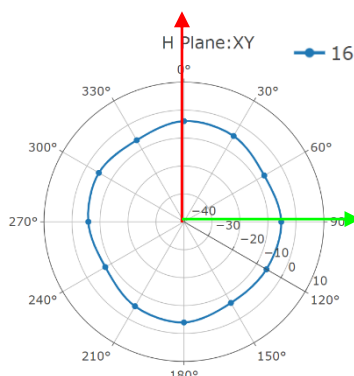
1602 MHz



— 1575MHz

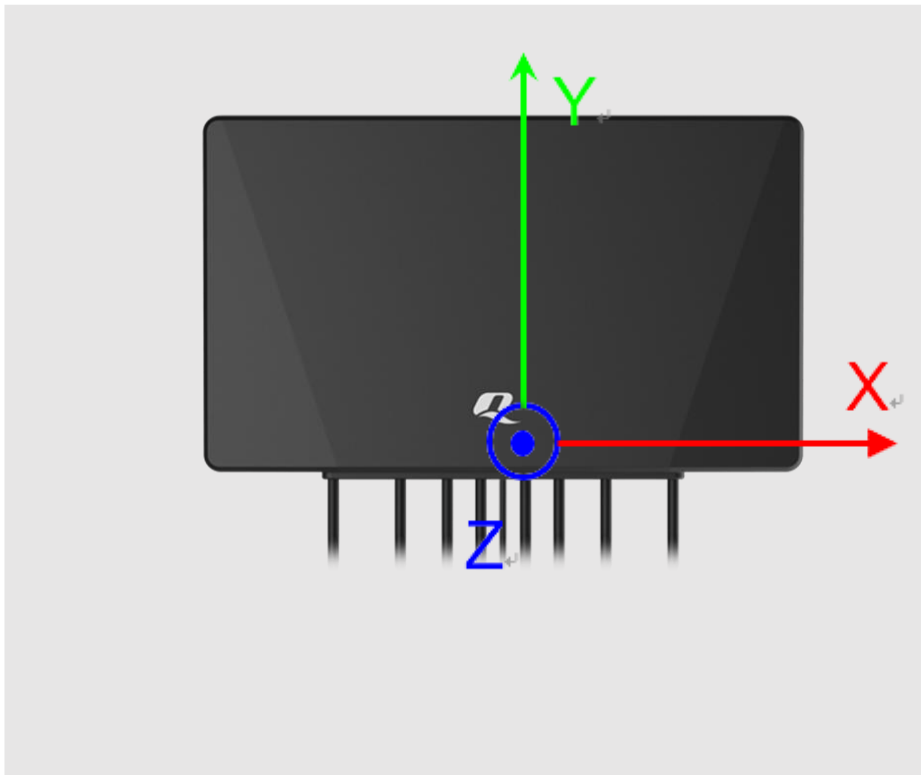


— 1602MHz



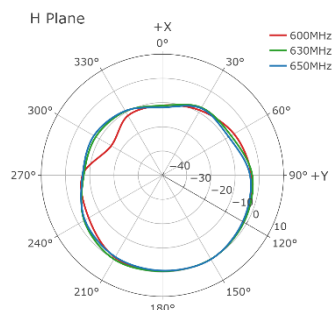
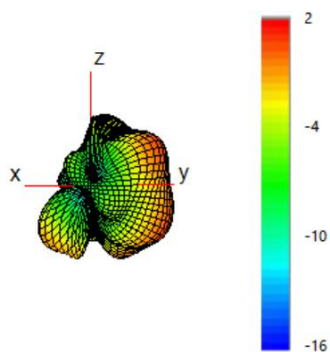
3.2.5.2. Test Condition: On 500 ×500 mm Metal Plane

- Test Chamber: HF-G-1

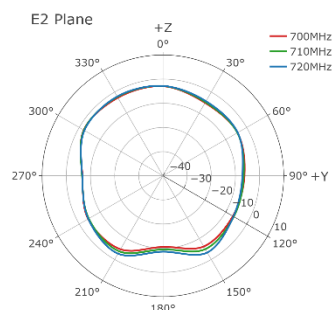
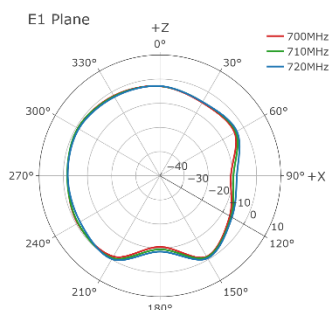
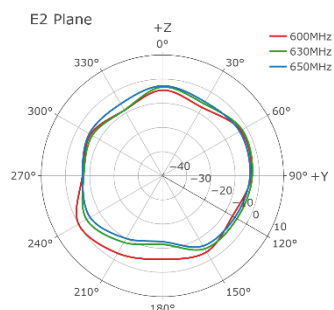
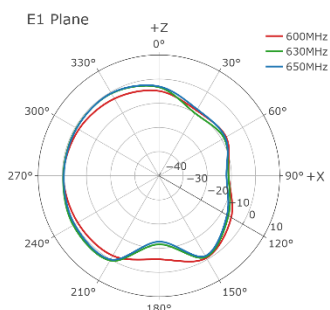
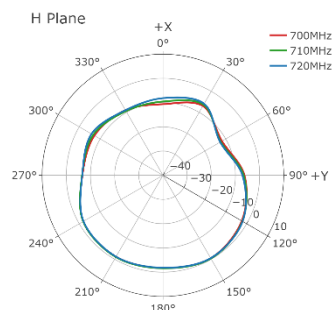
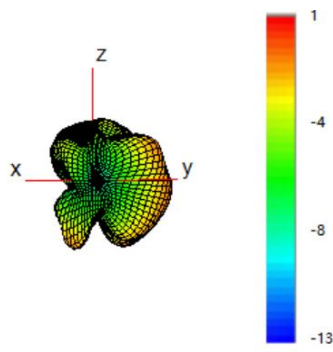


● **LMH1**

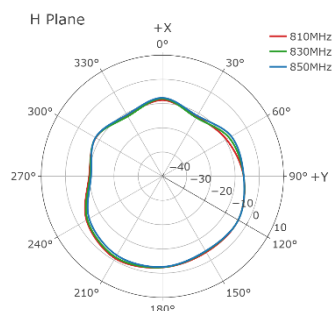
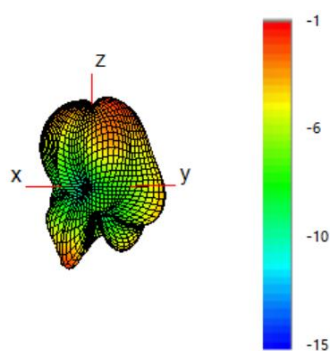
630 MHz



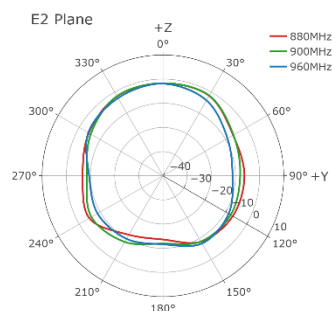
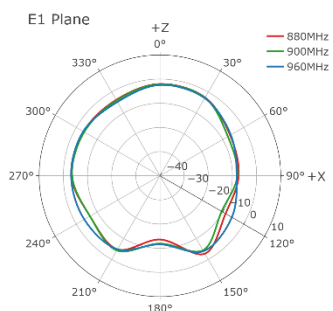
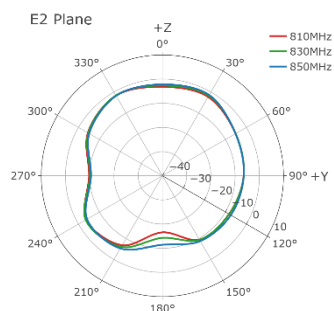
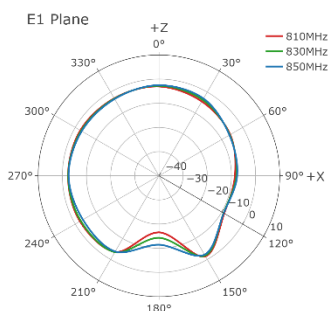
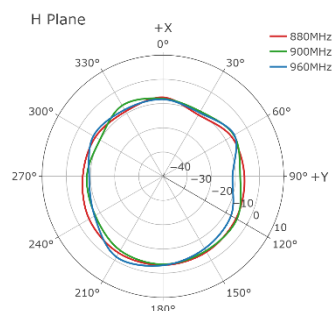
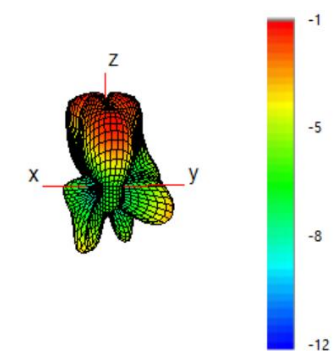
710 MHz



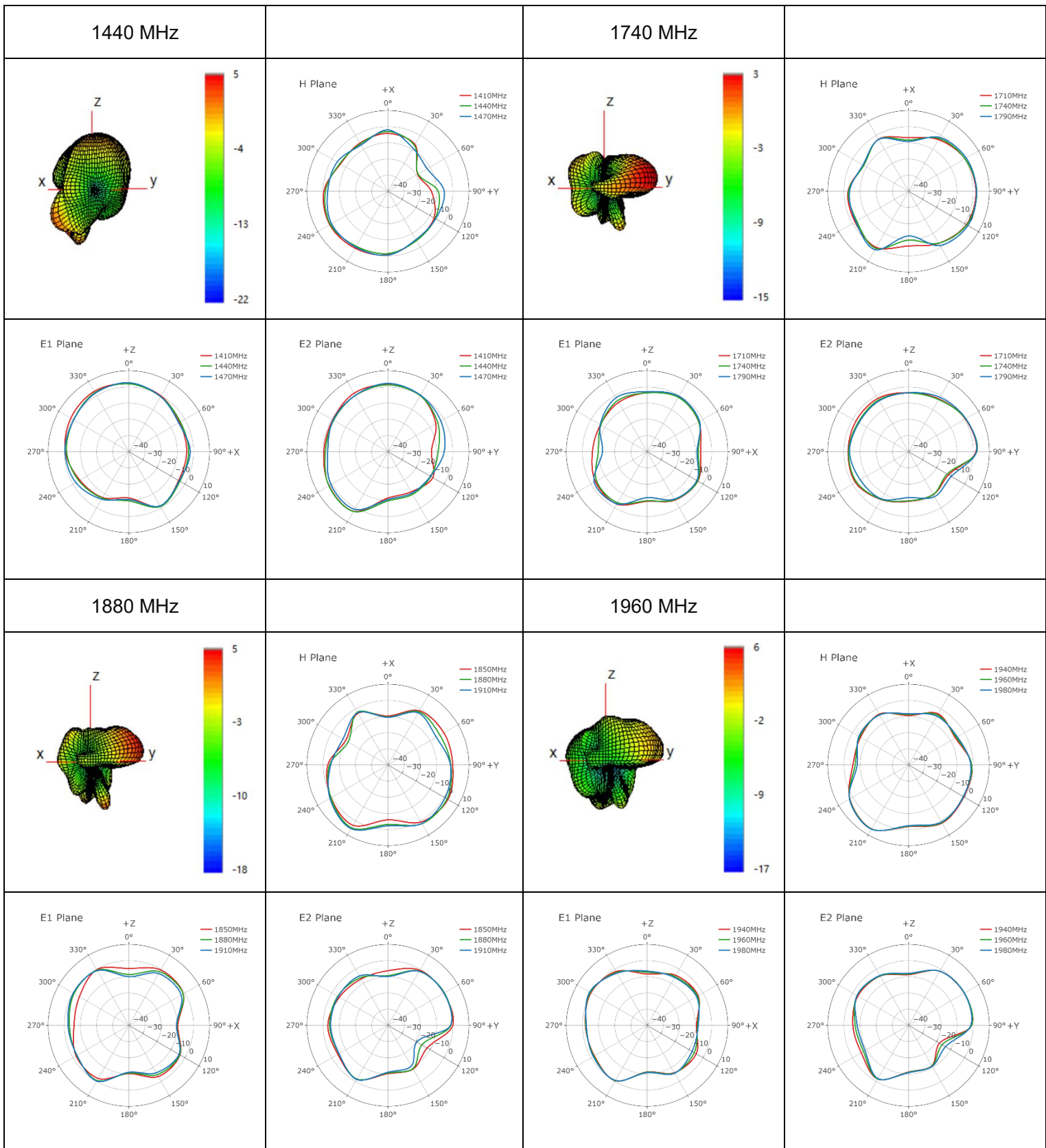
830 MHz



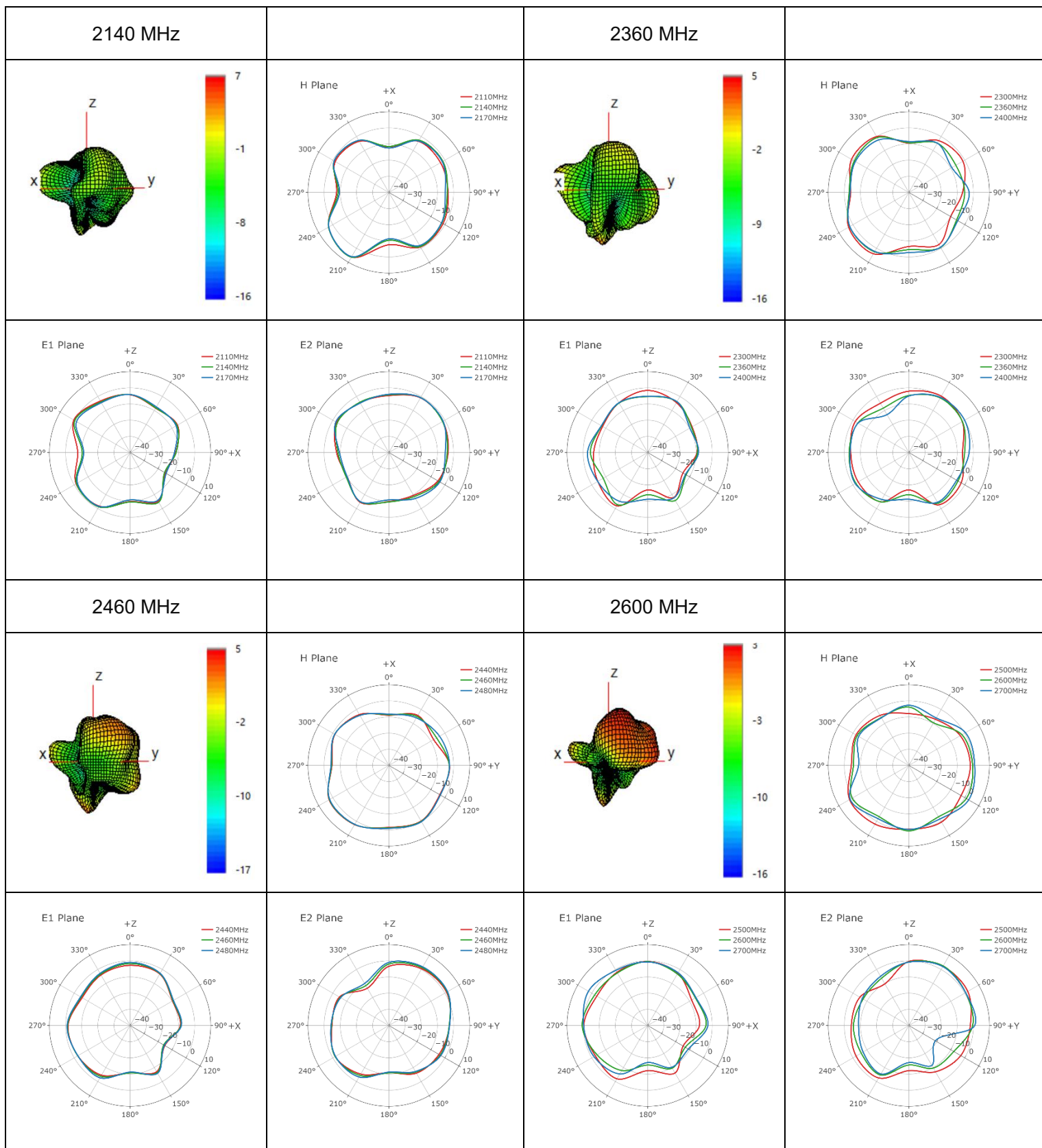
900 MHz



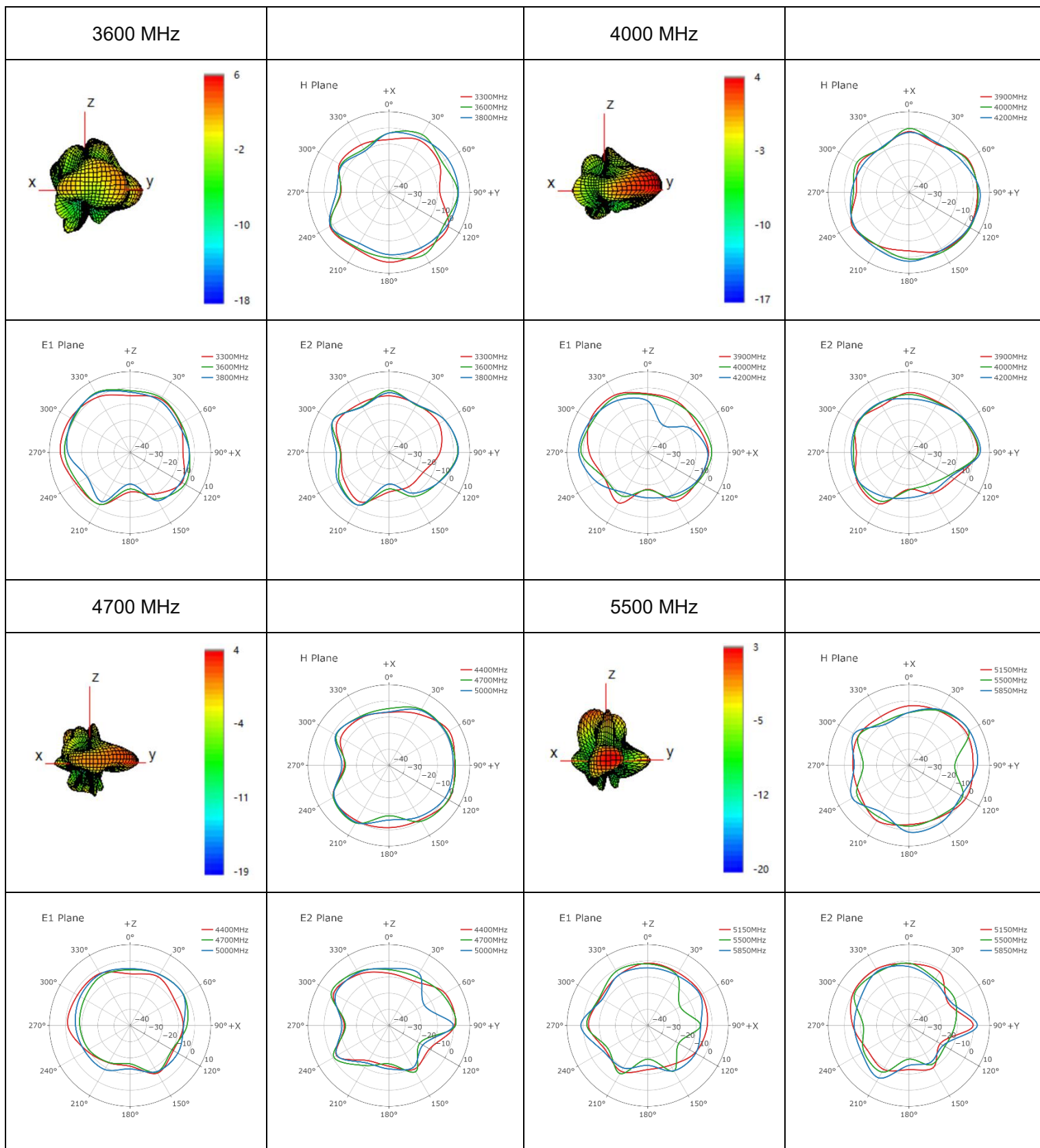
● **LMH1**



● **LMH1**

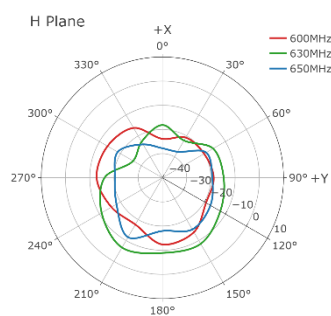
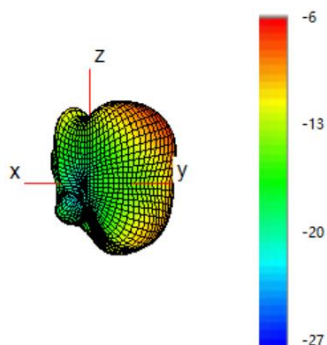


● **LMH1**

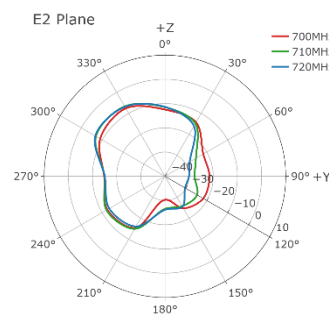
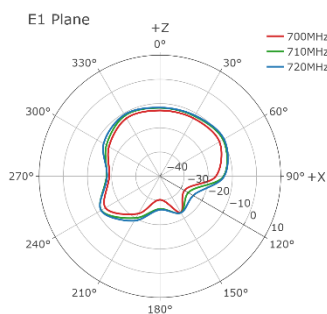
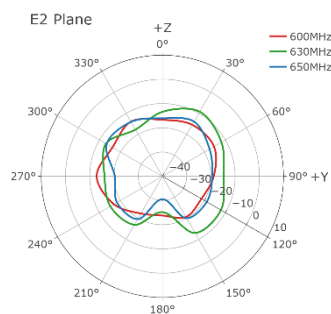
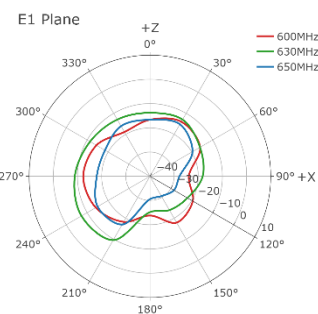
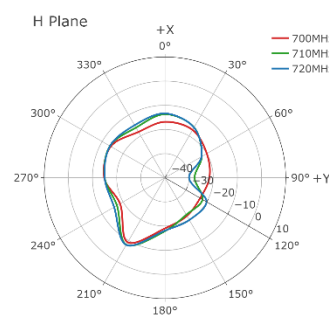
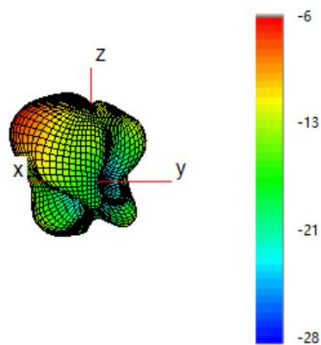


● **LMH2**

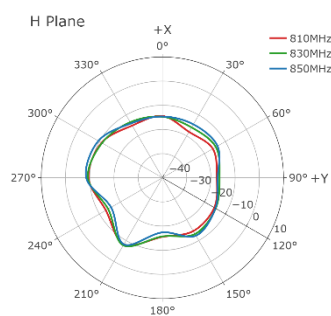
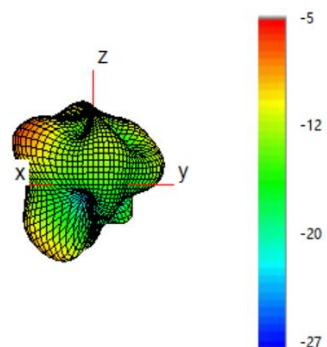
630 MHz



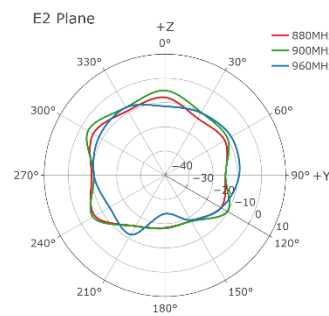
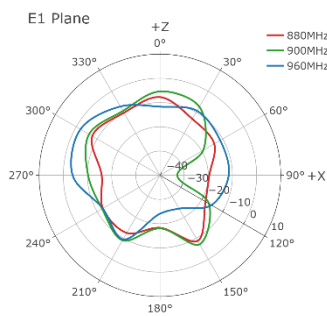
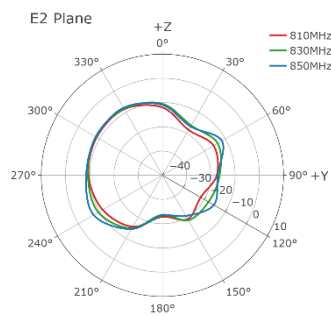
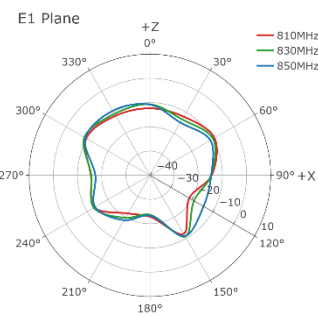
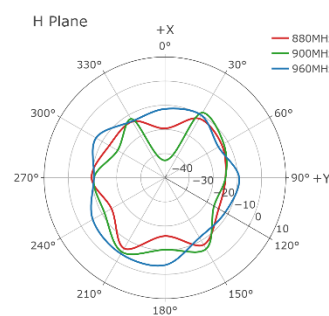
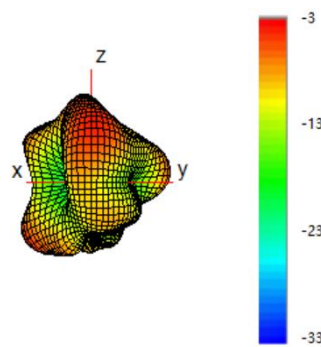
710 MHz



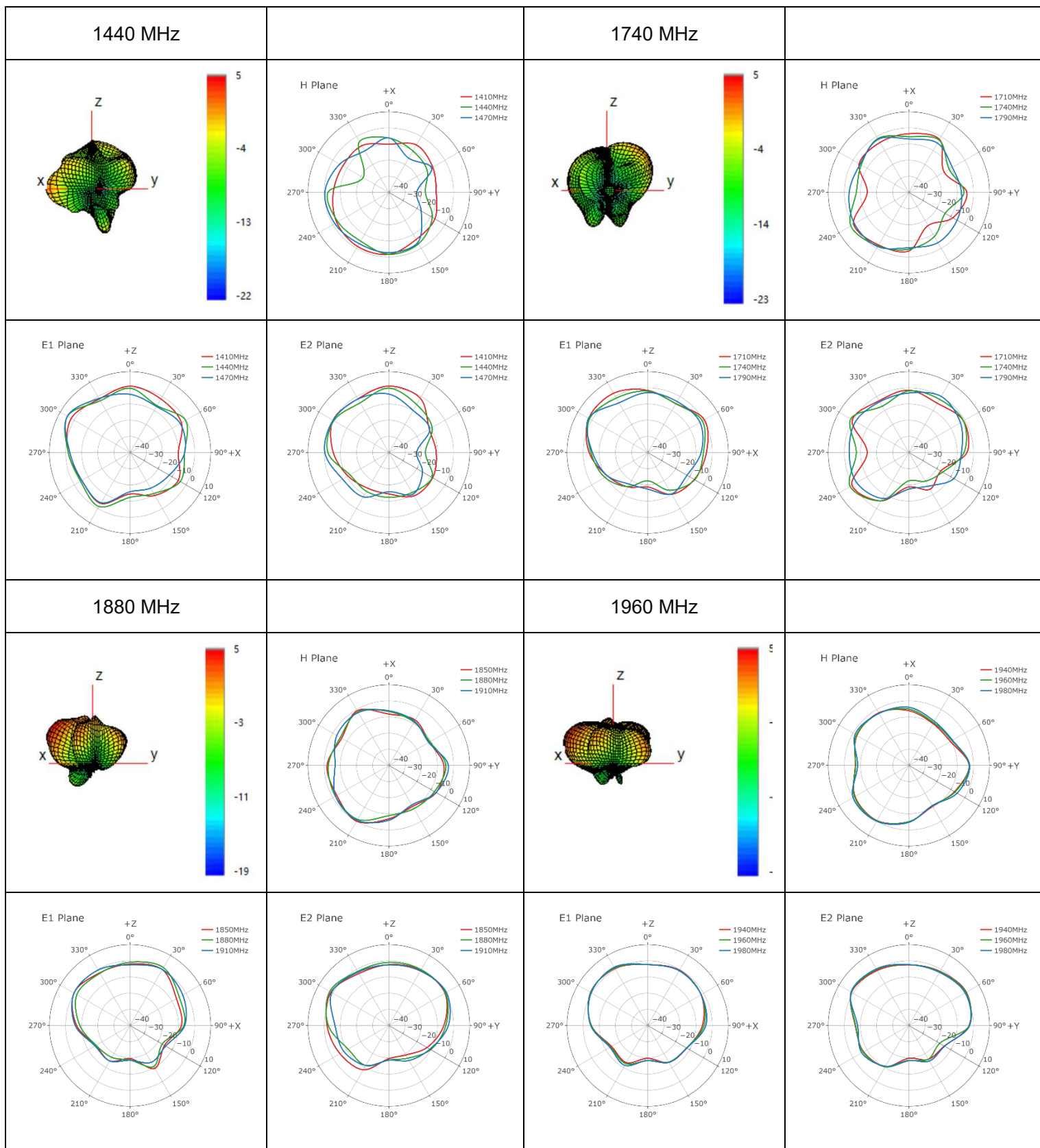
830 MHz



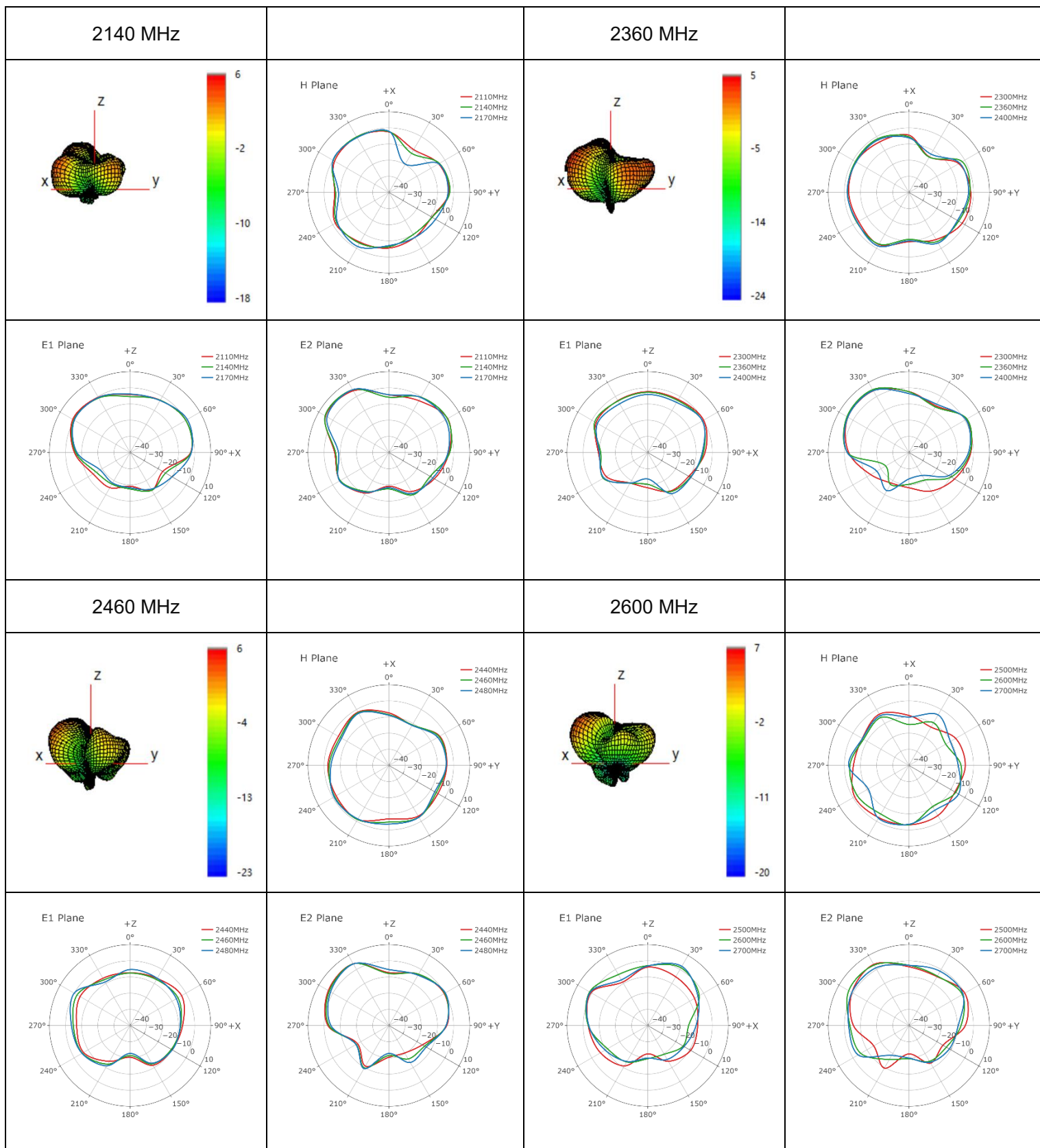
900 MHz



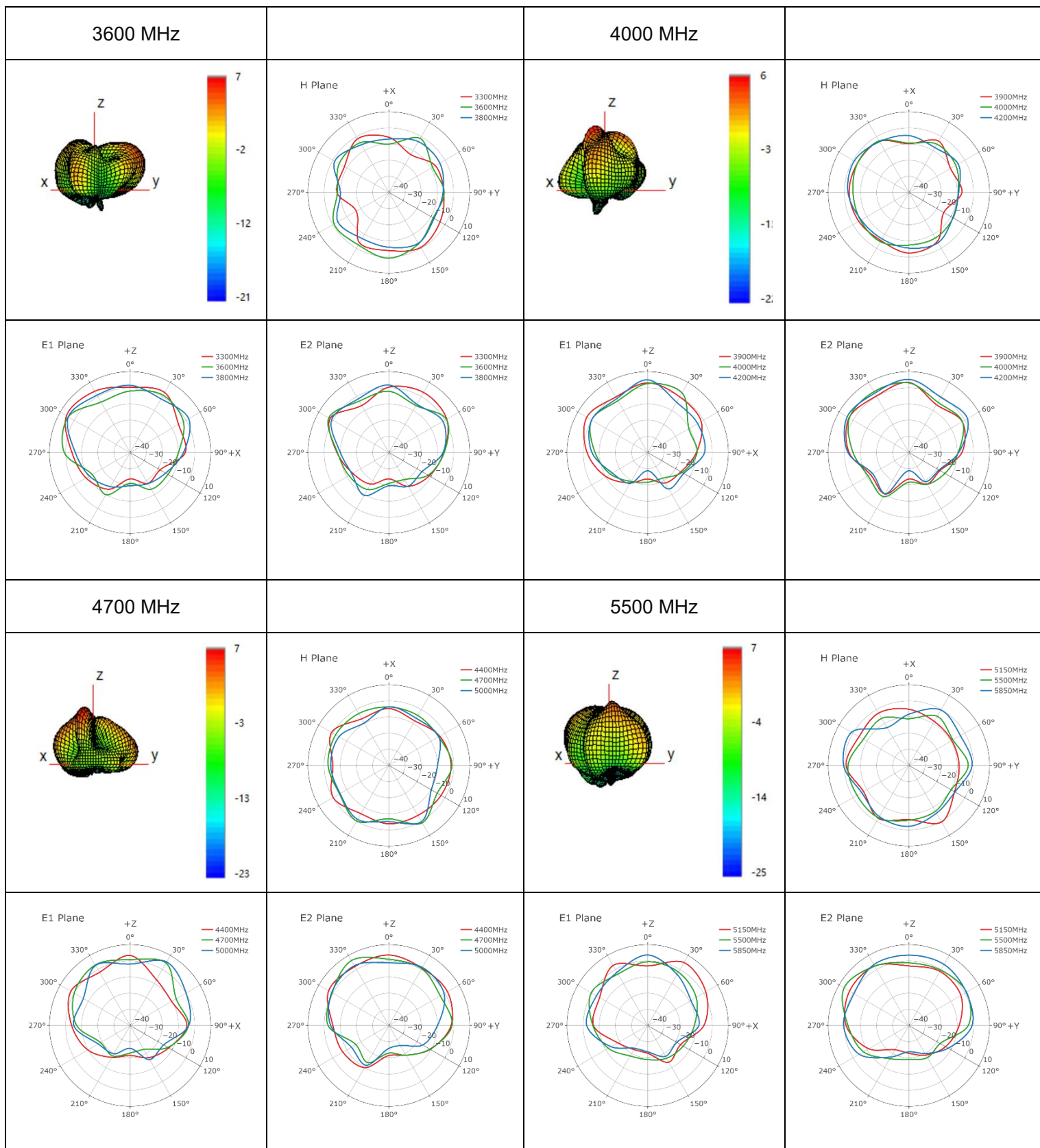
● **LMH2**



● **LMH2**

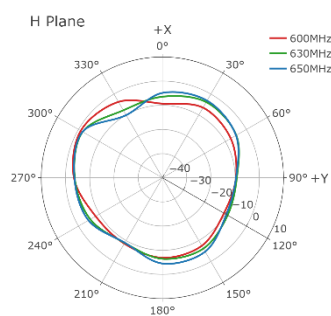
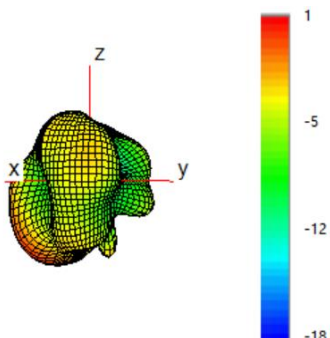


● **LMH2**

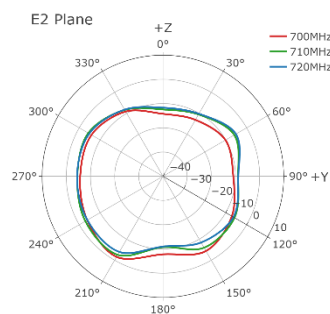
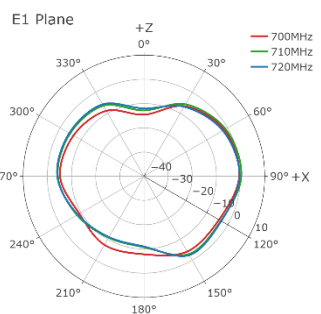
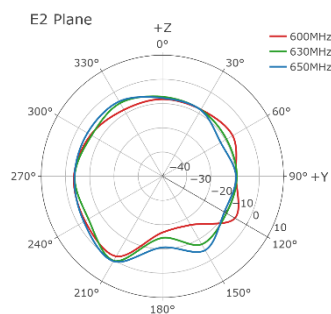
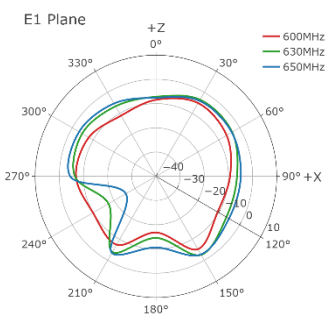
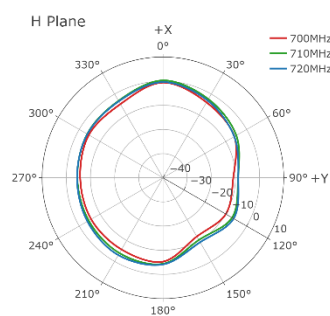
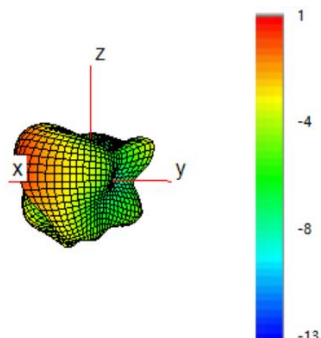


● **LMH3**

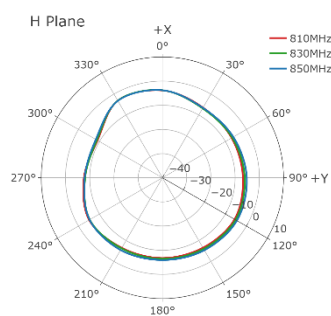
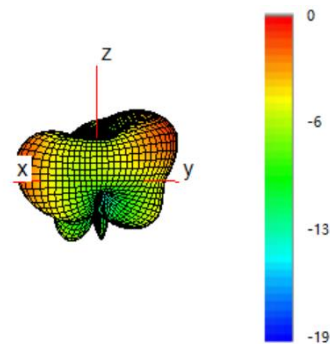
630 MHz



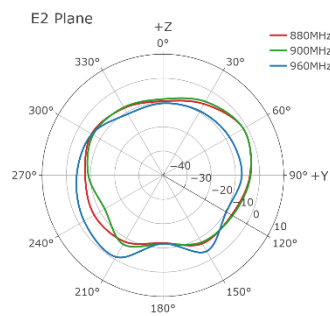
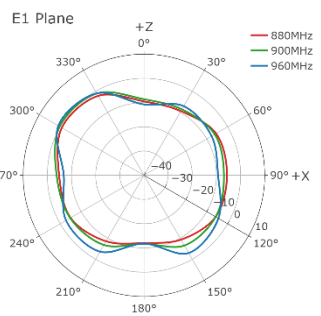
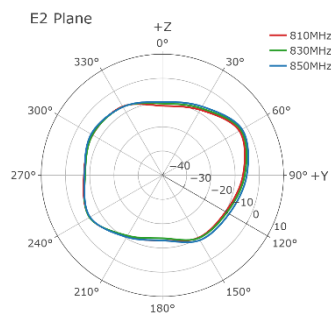
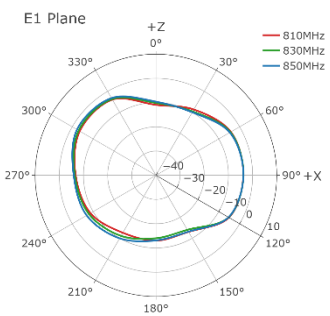
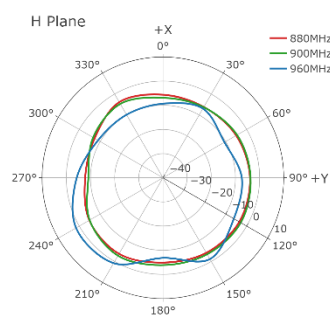
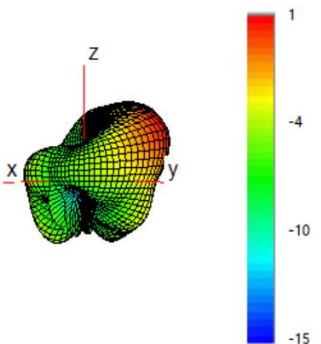
710 MHz



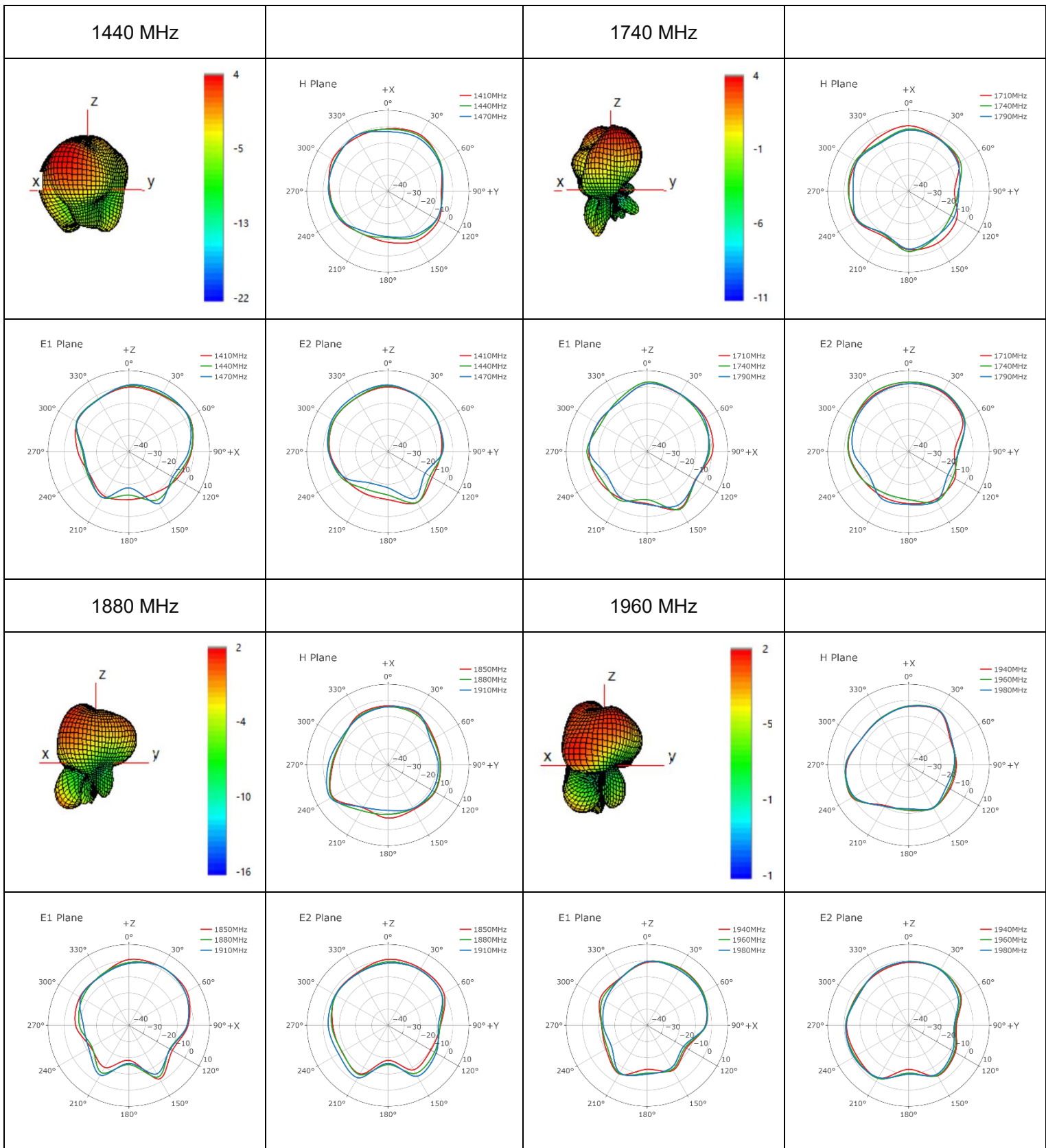
830 MHz



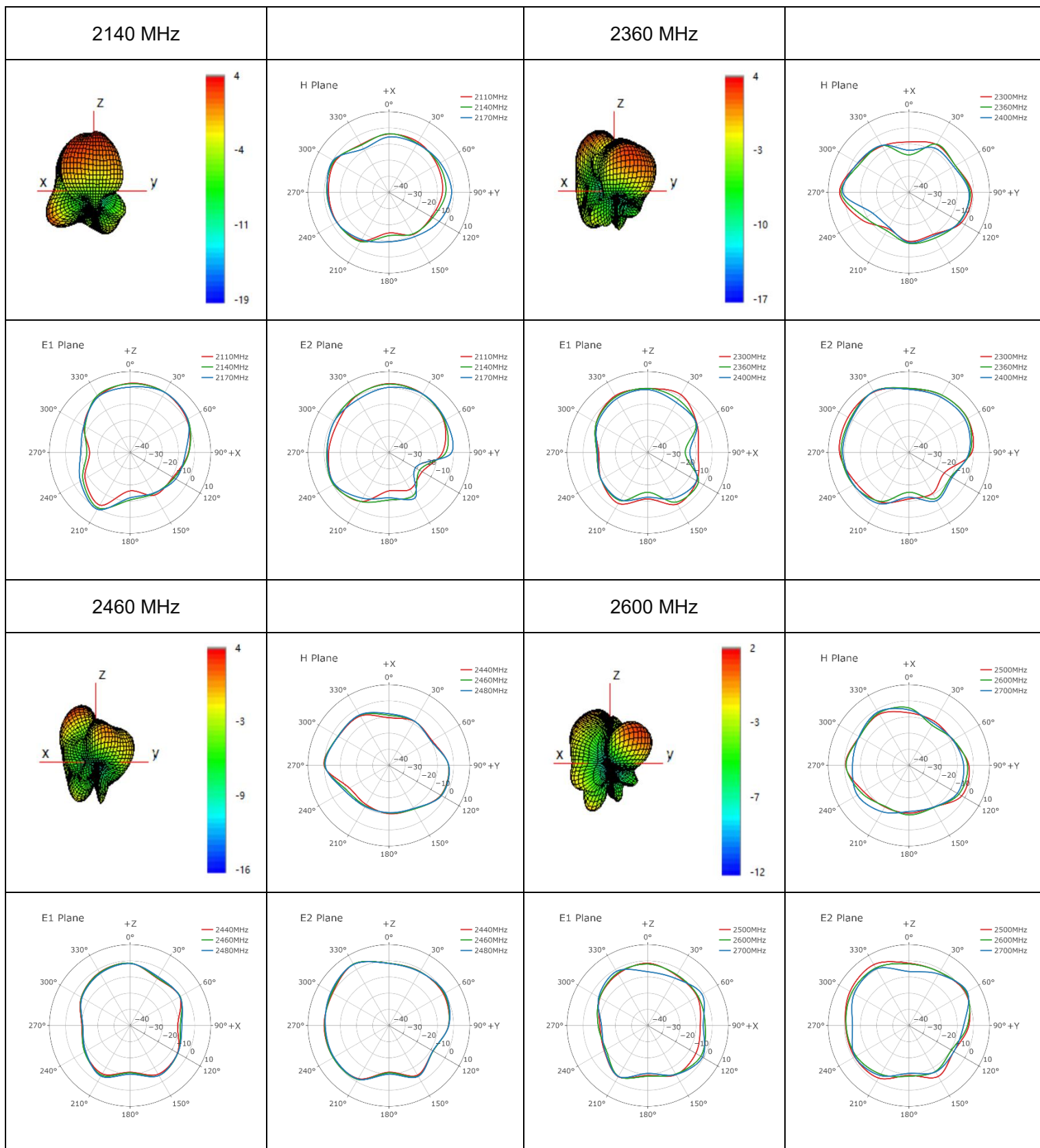
900 MHz



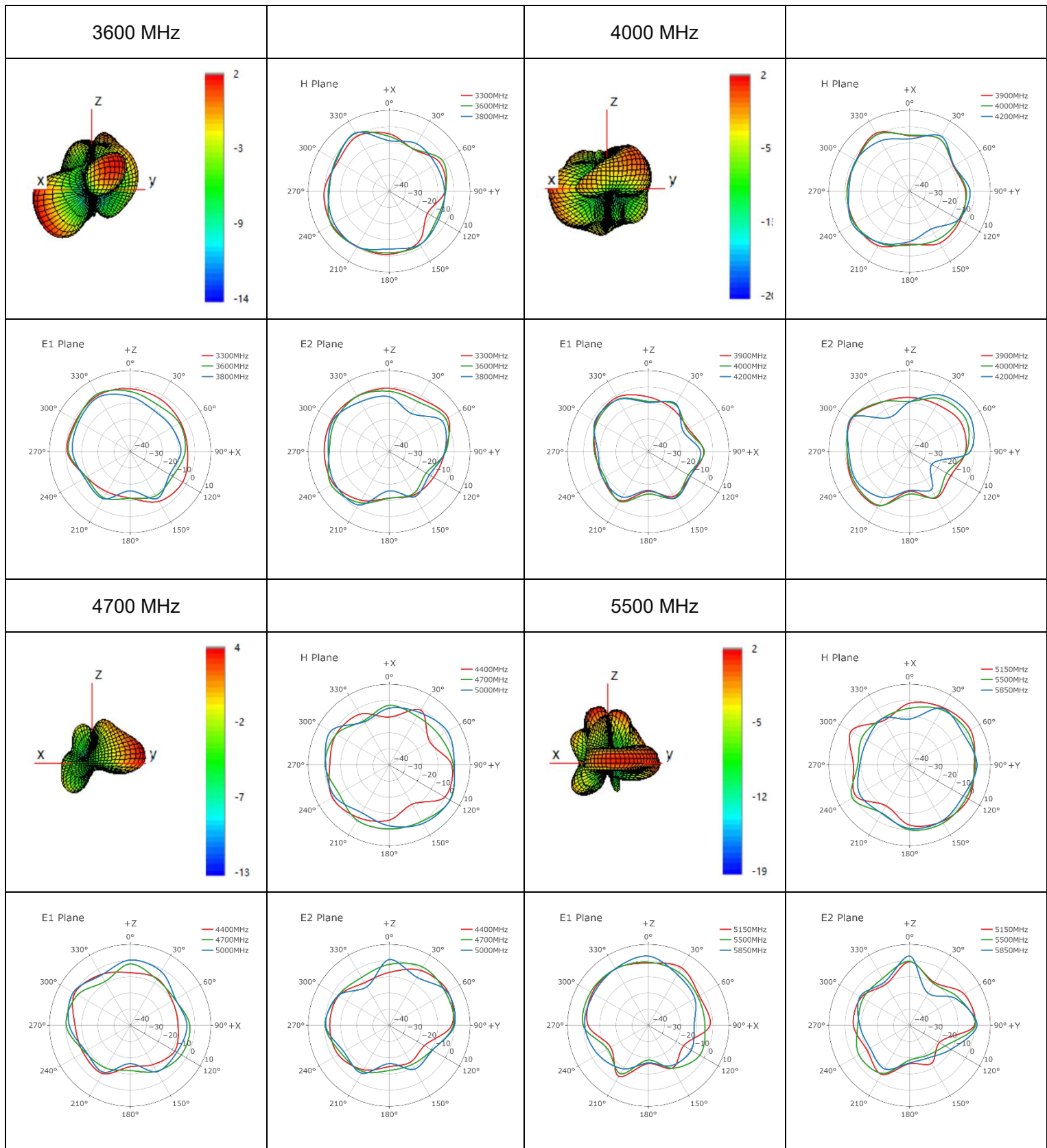
● **LMH3**



● **LMH3**

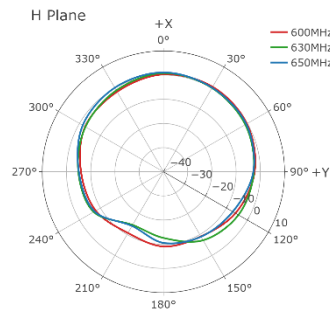
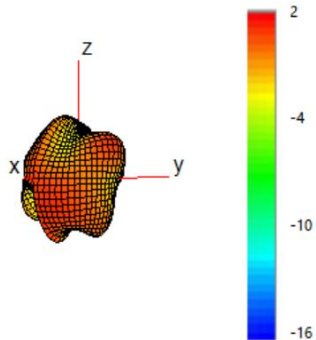


● **LMH3**

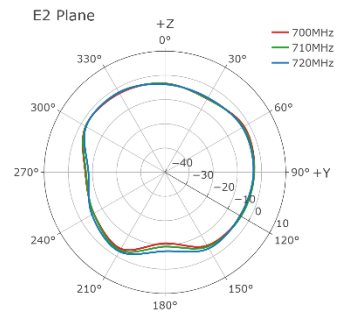
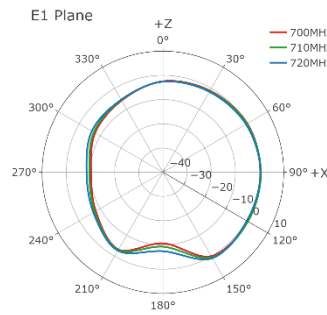
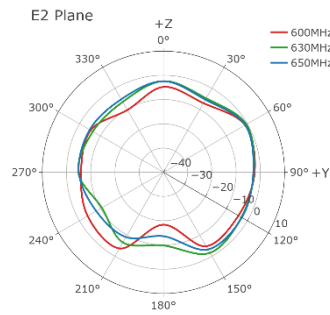
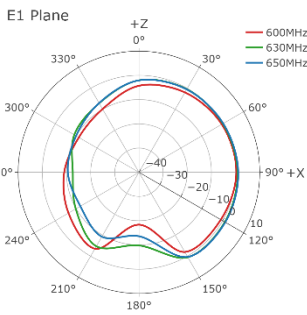
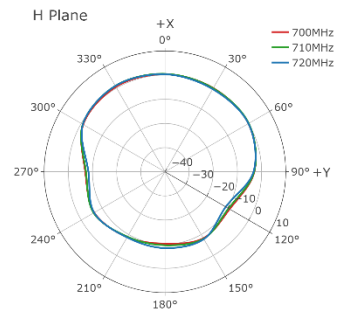
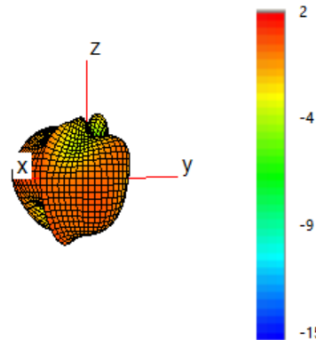


● **LMH4**

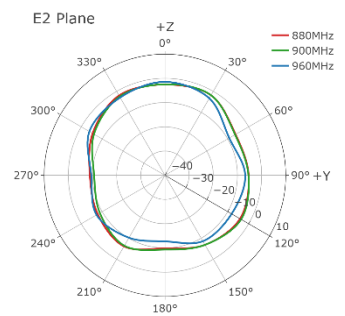
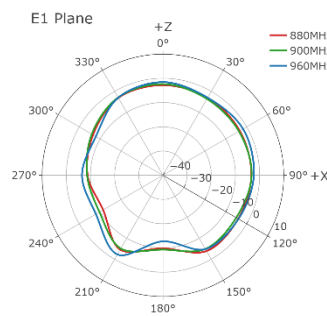
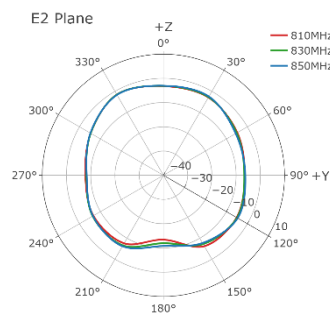
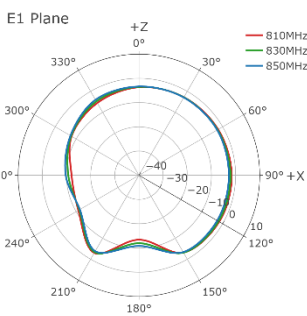
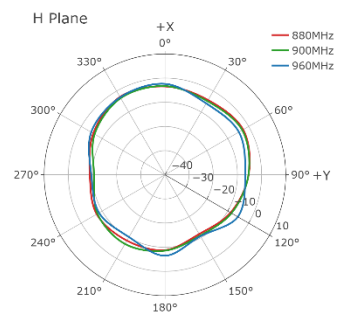
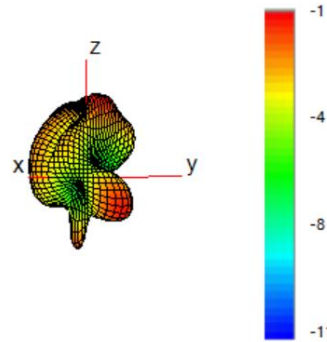
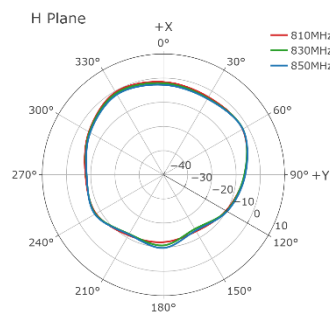
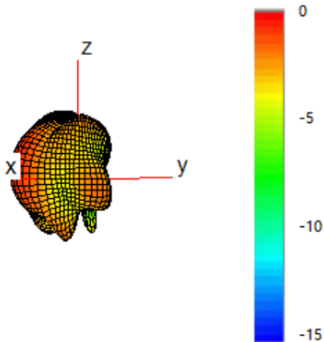
630 MHz



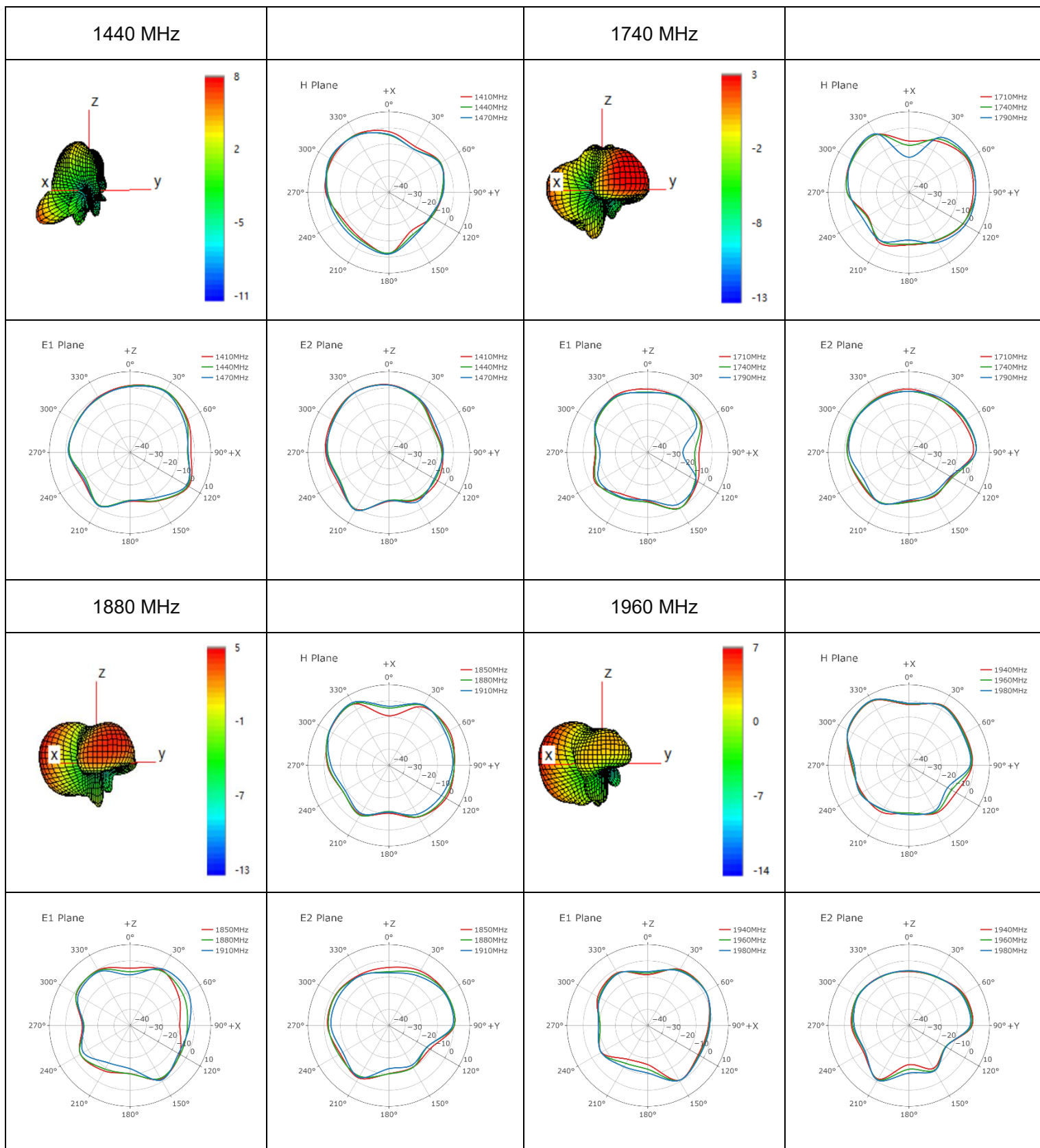
710 MHz



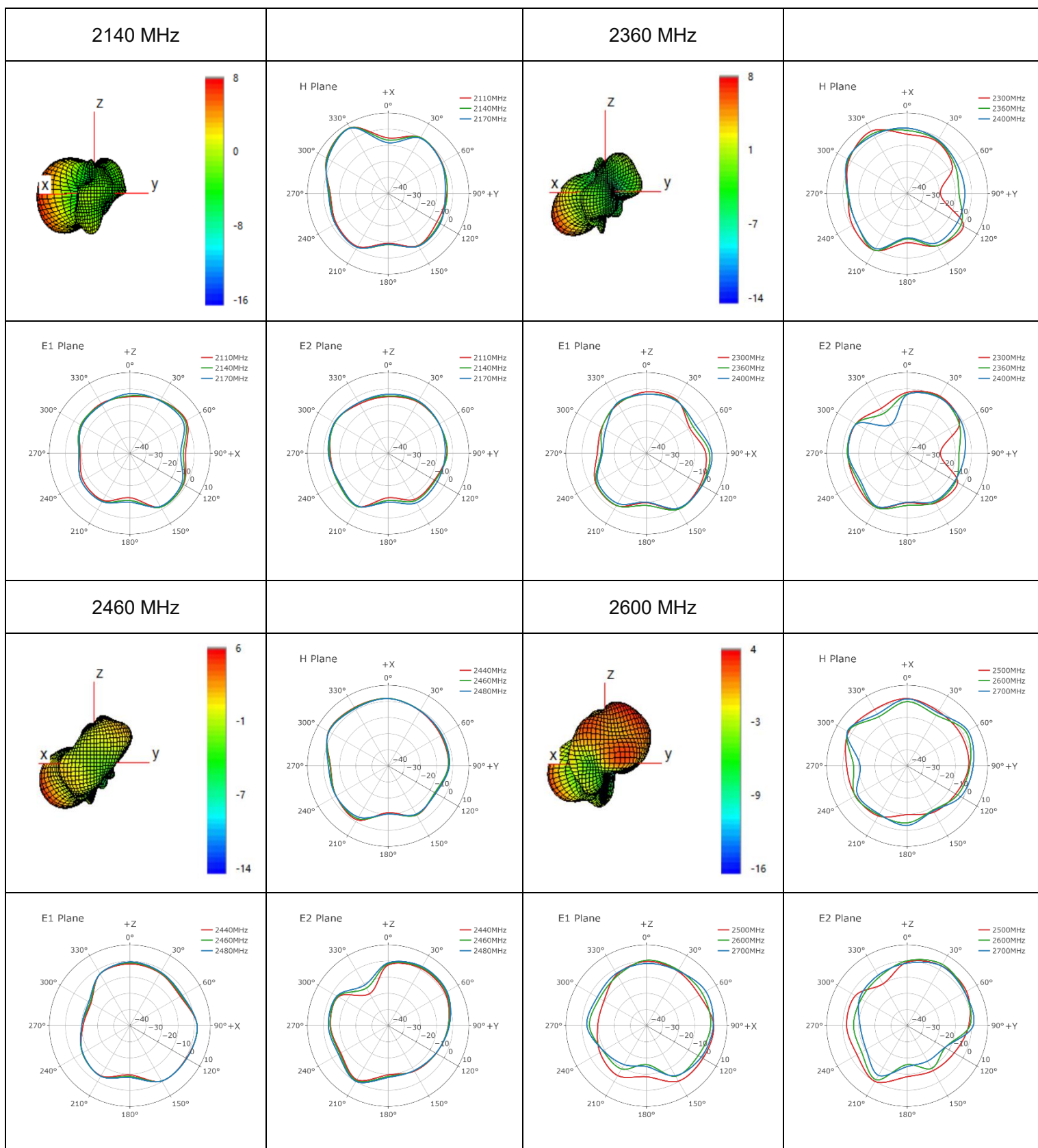
830 MHz



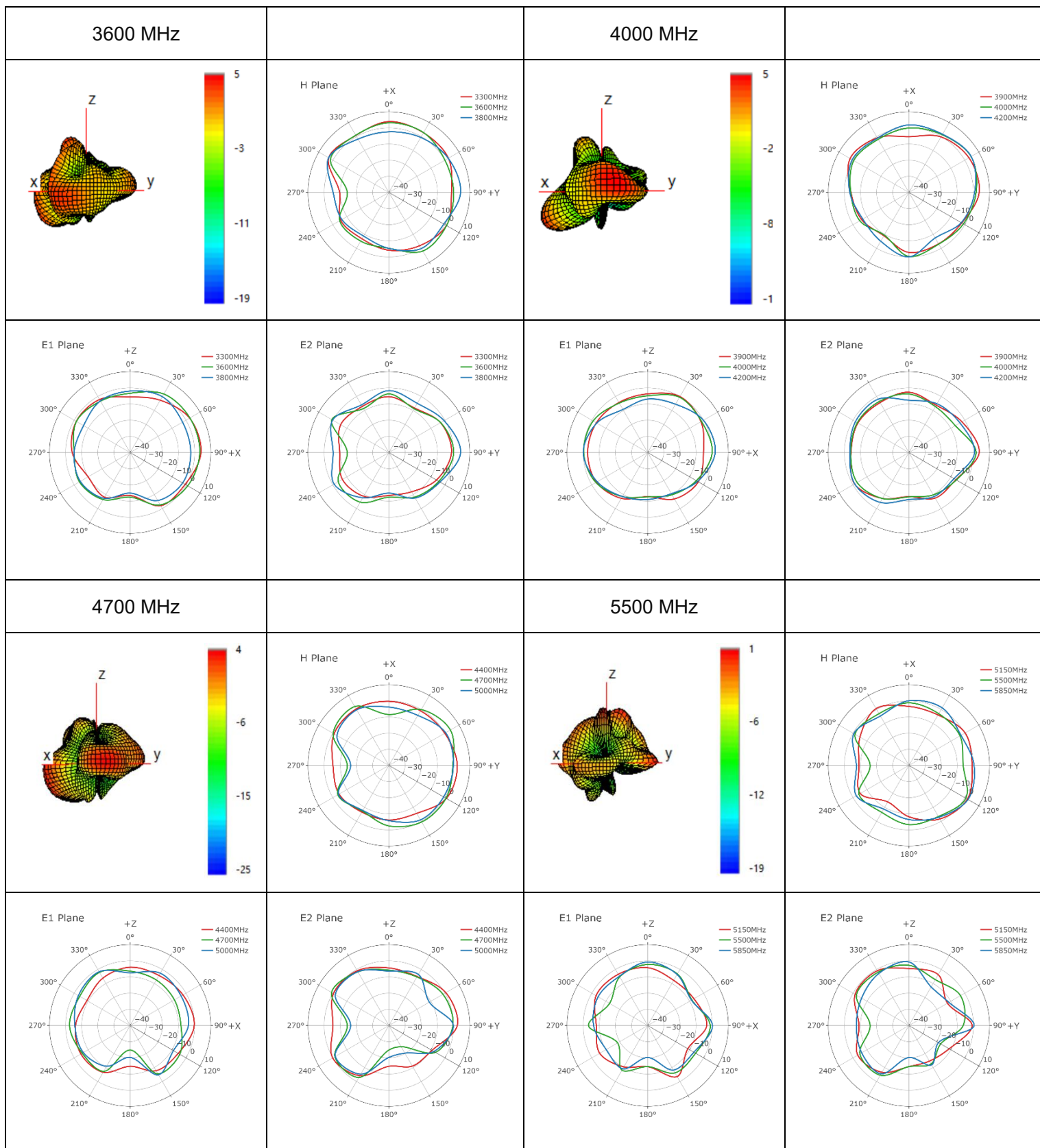
● **LMH4**



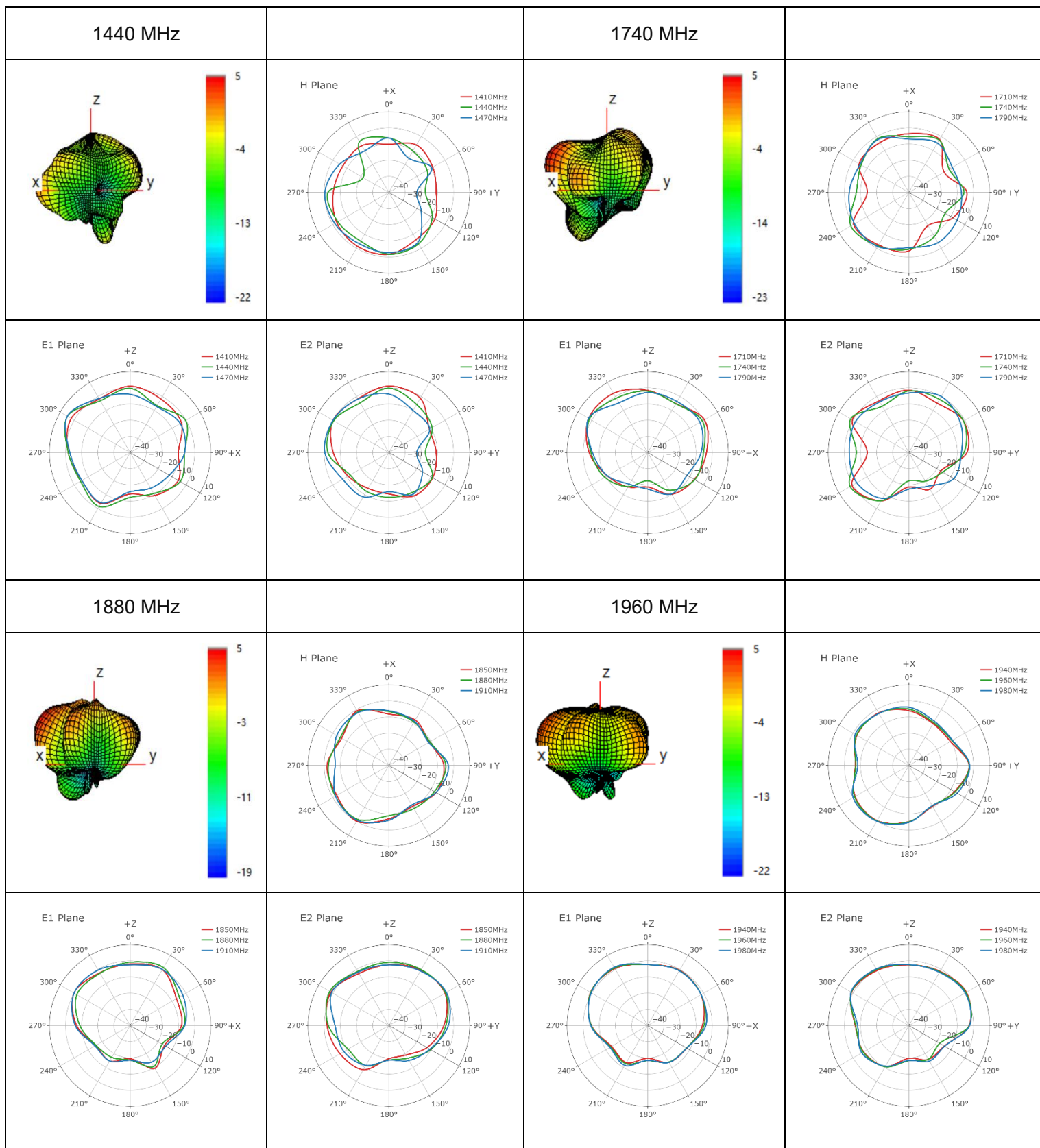
● **LMH4**



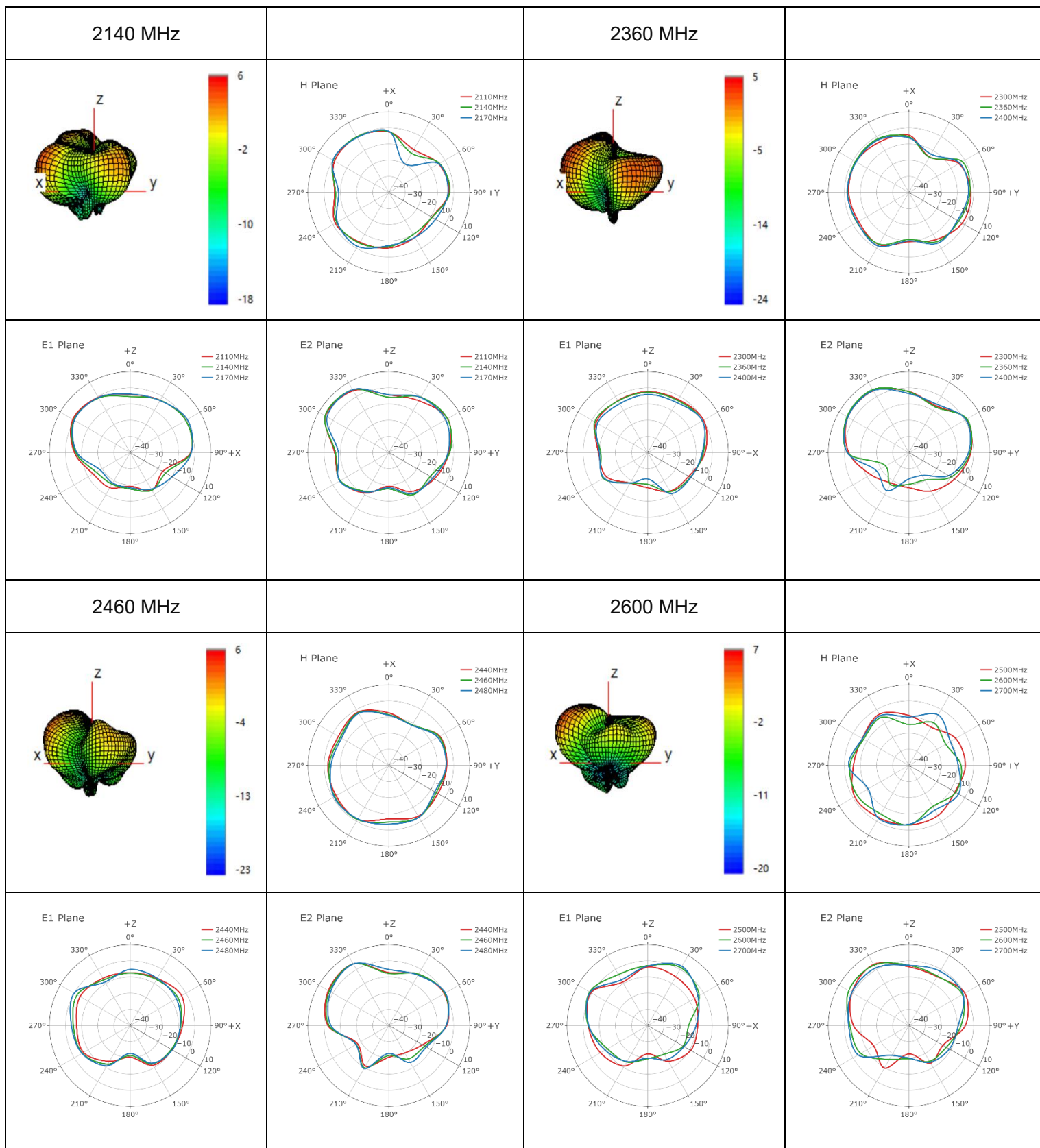
● **LMH4**



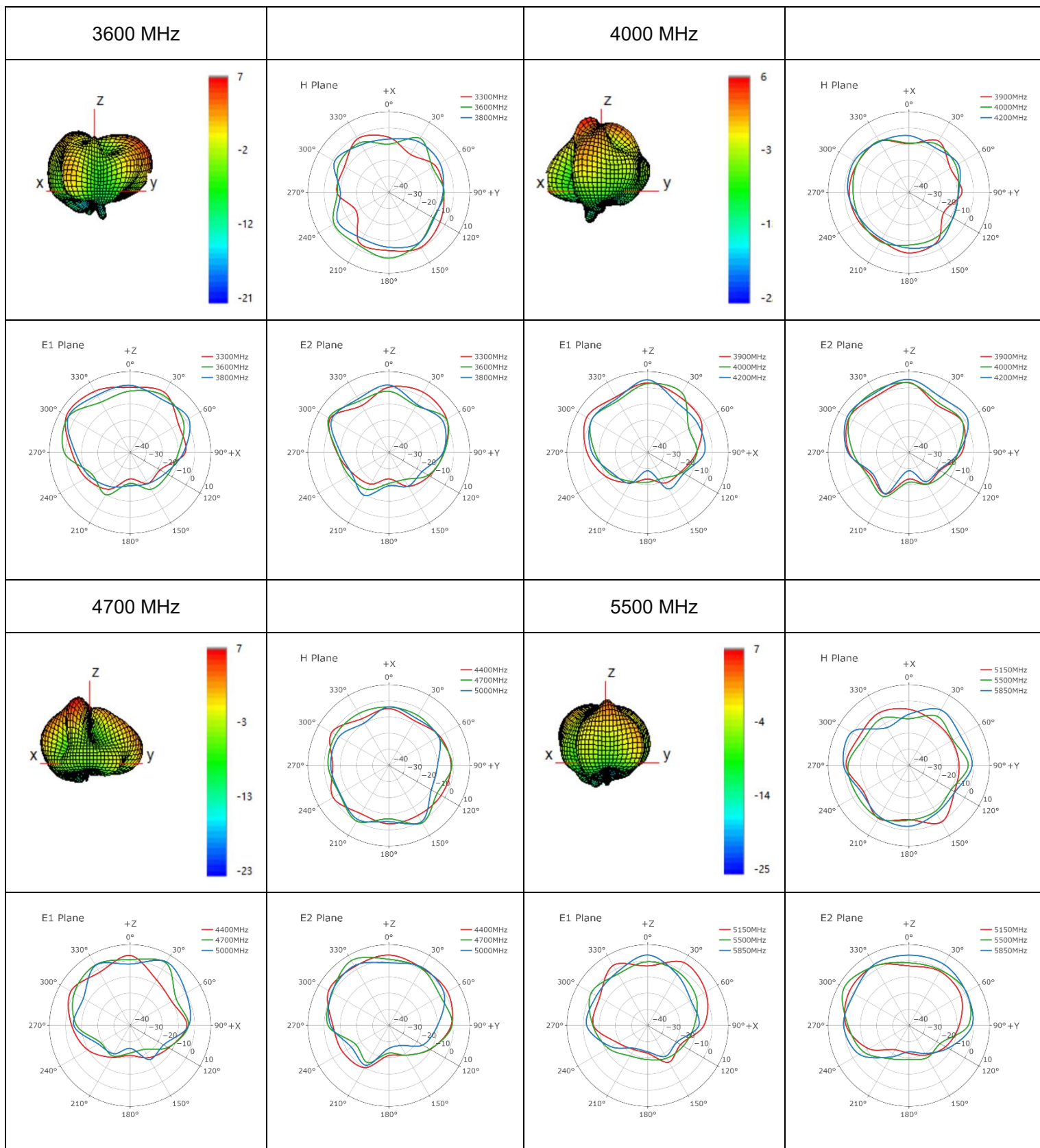
● **MH1**



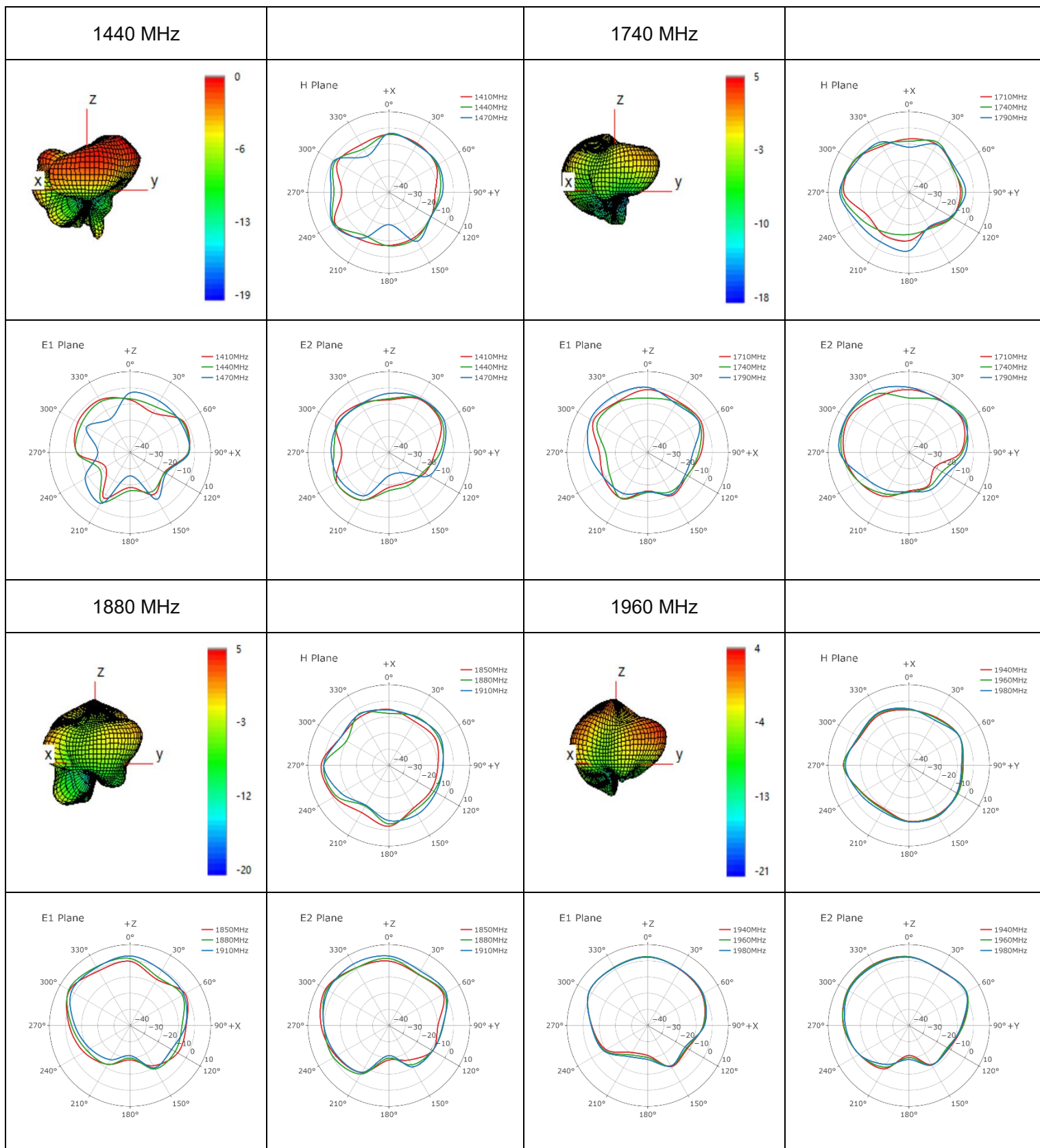
● **MH1**



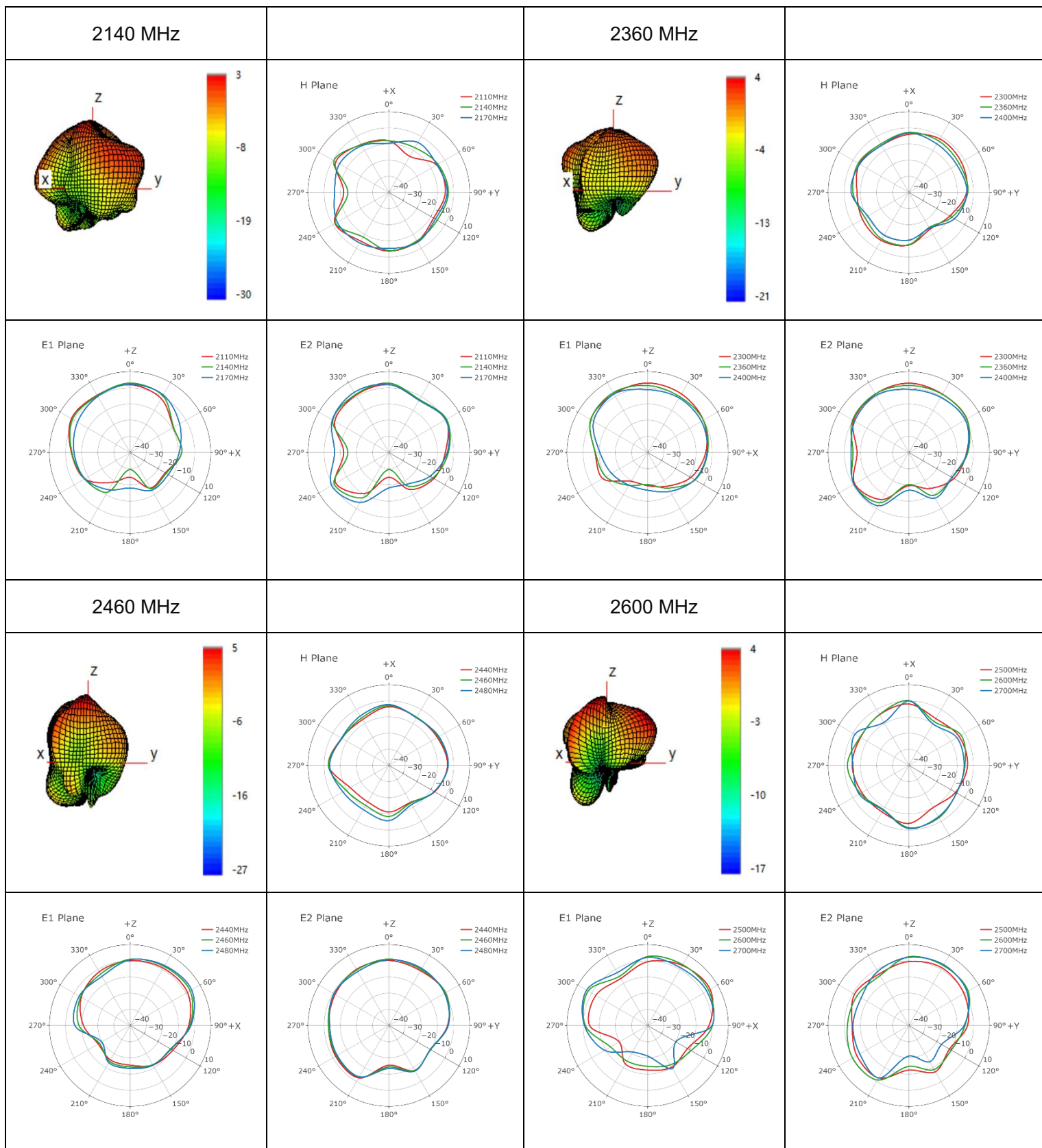
● **MH1**



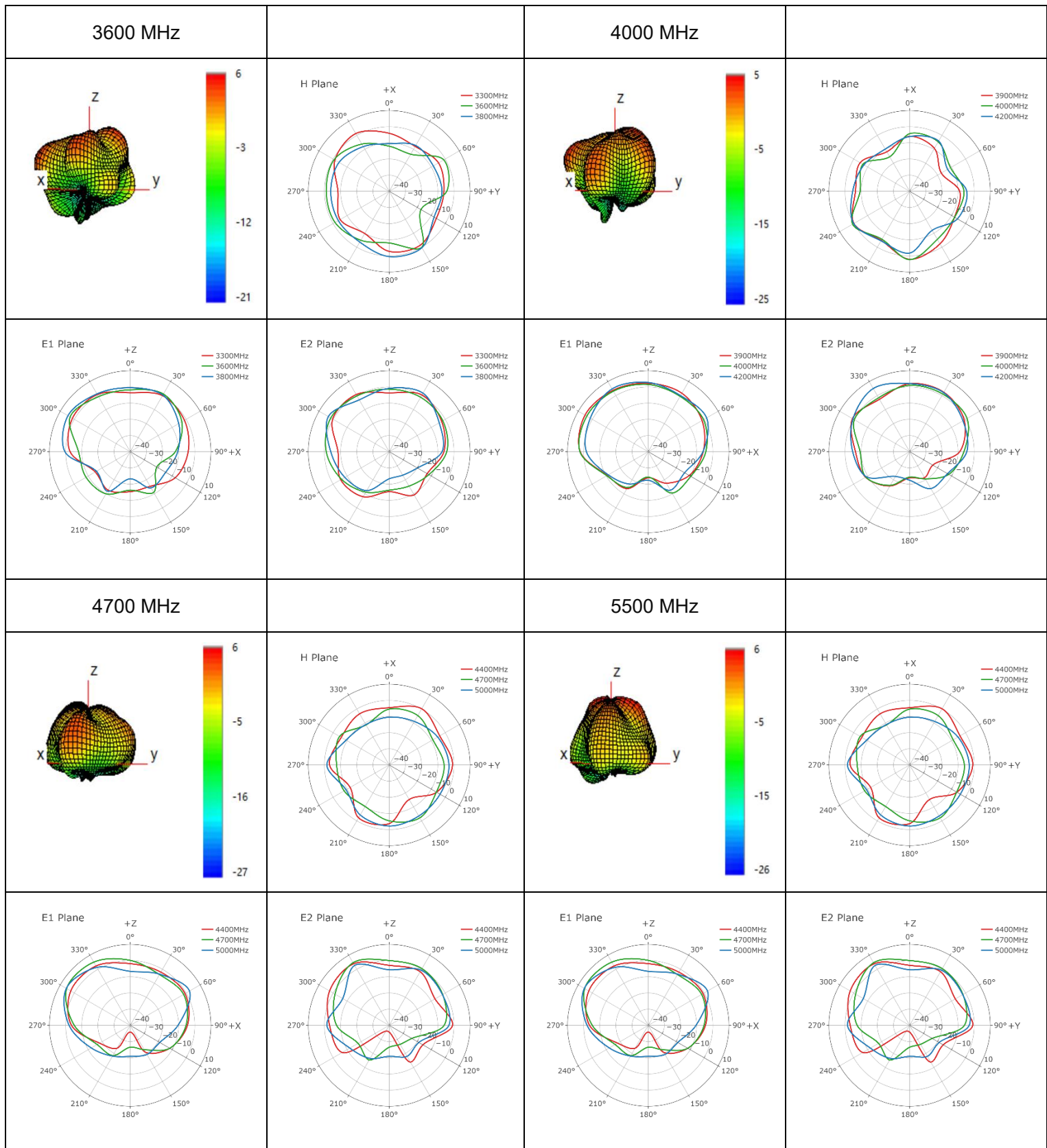
● **MH2**



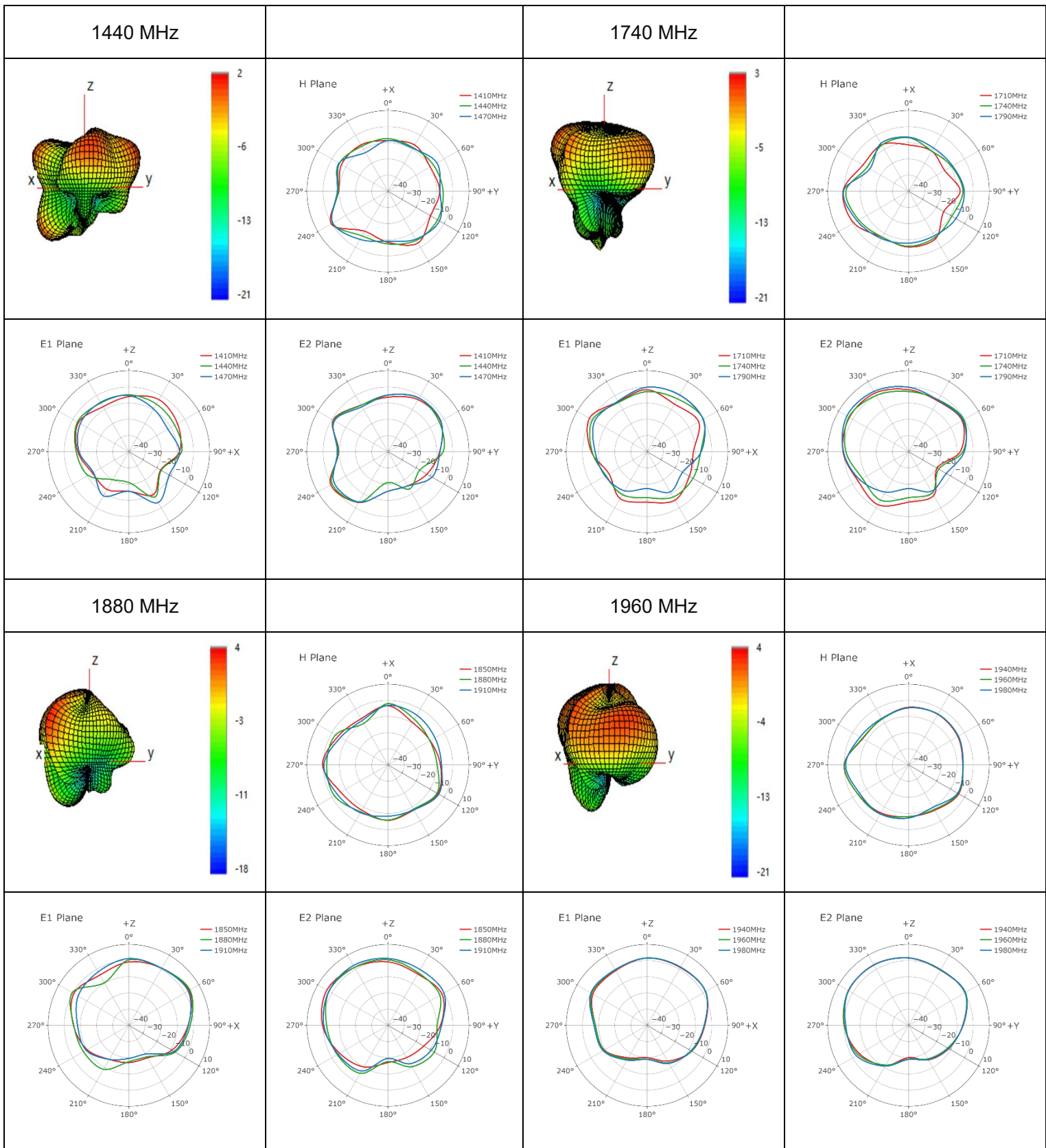
● **MH2**



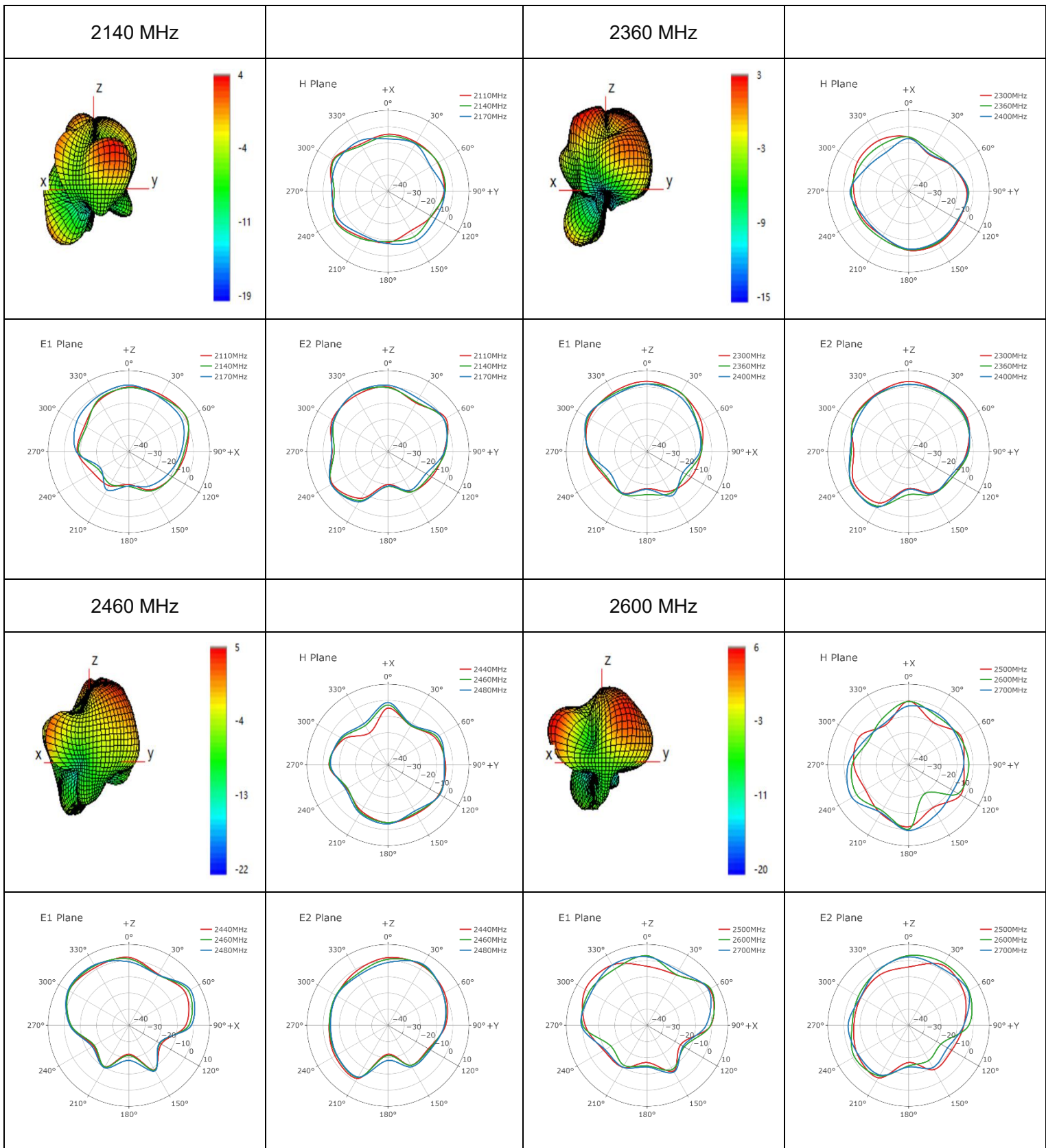
● **MH2**



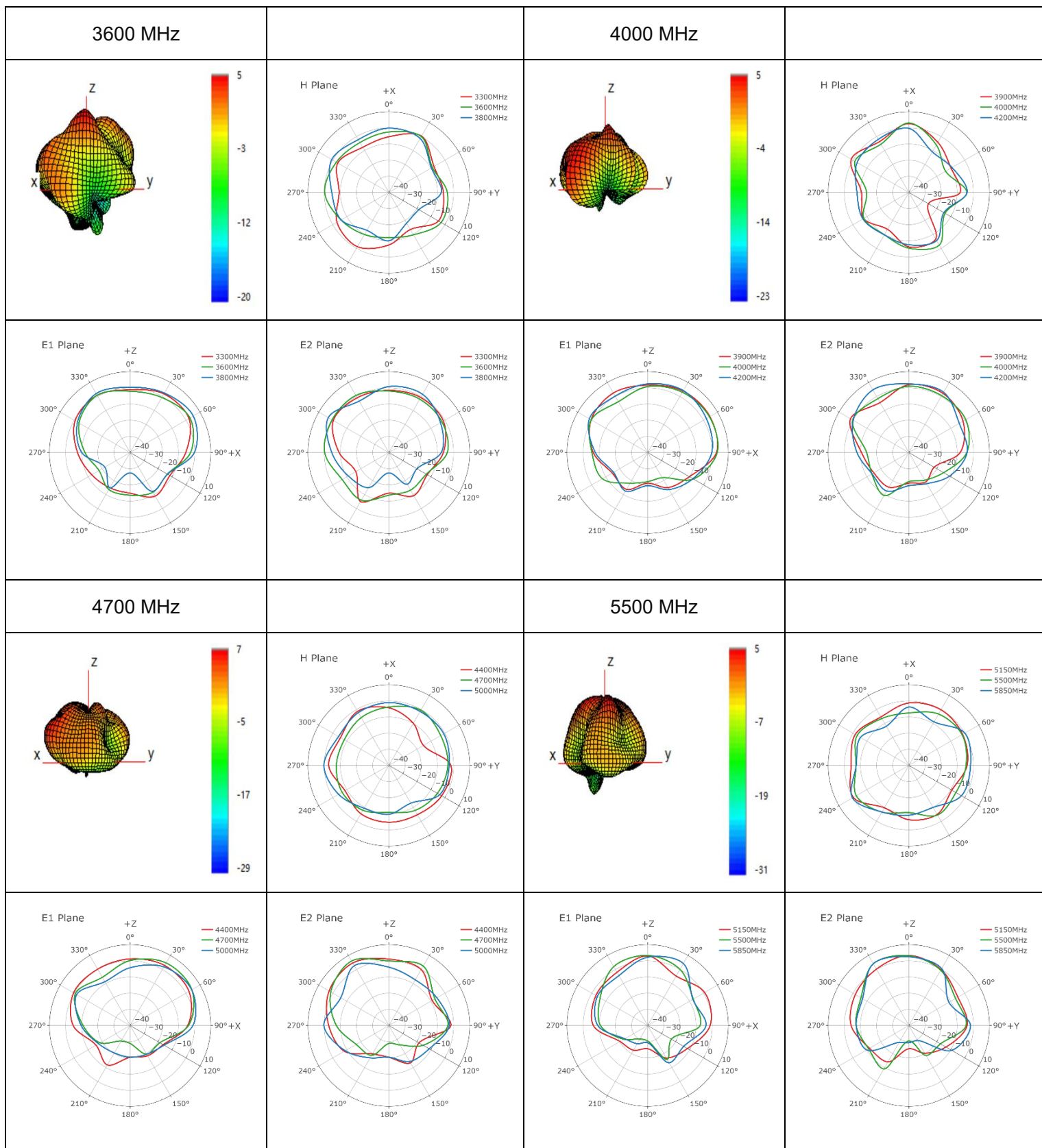
● **MH3**



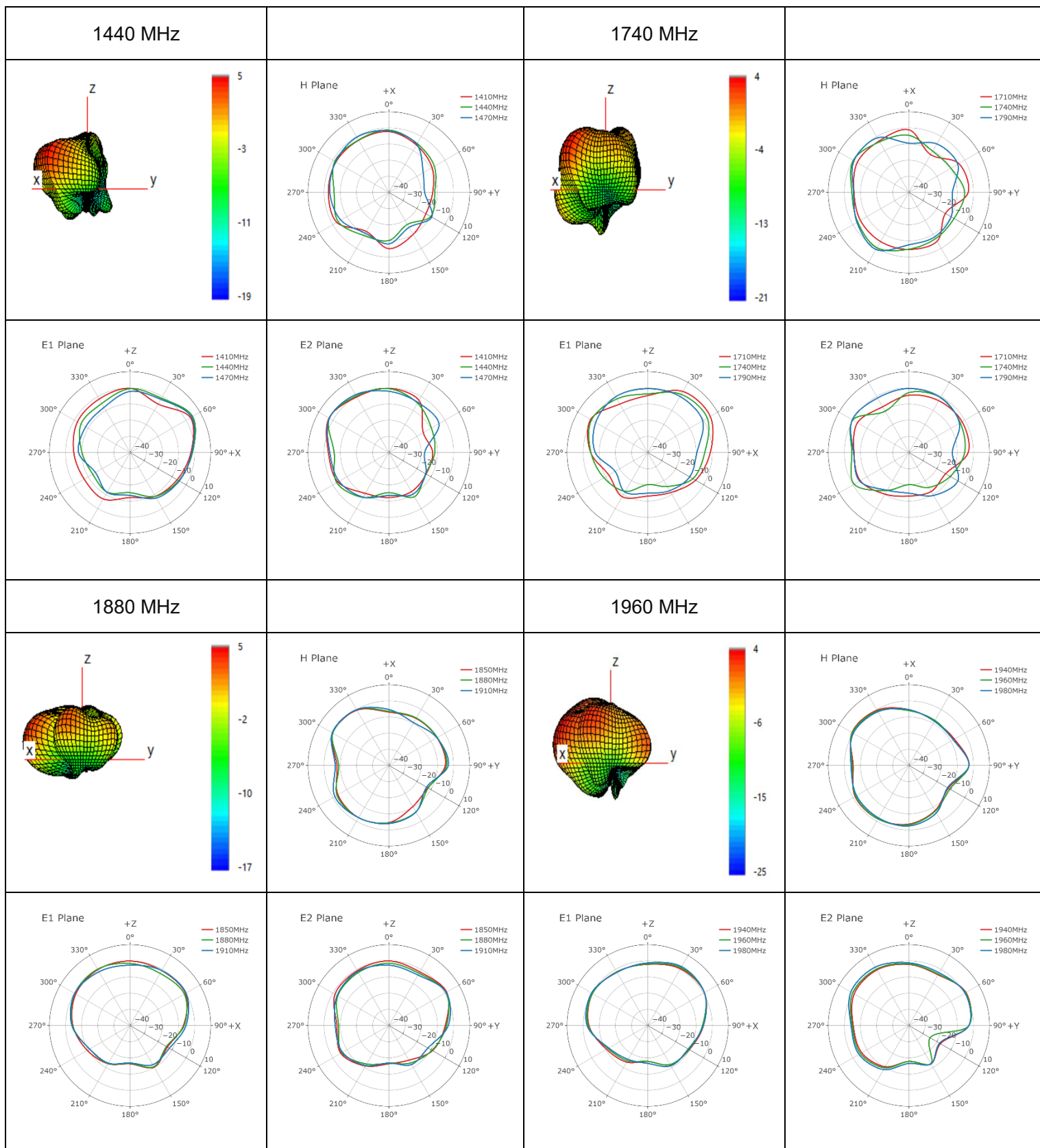
● **MH3**



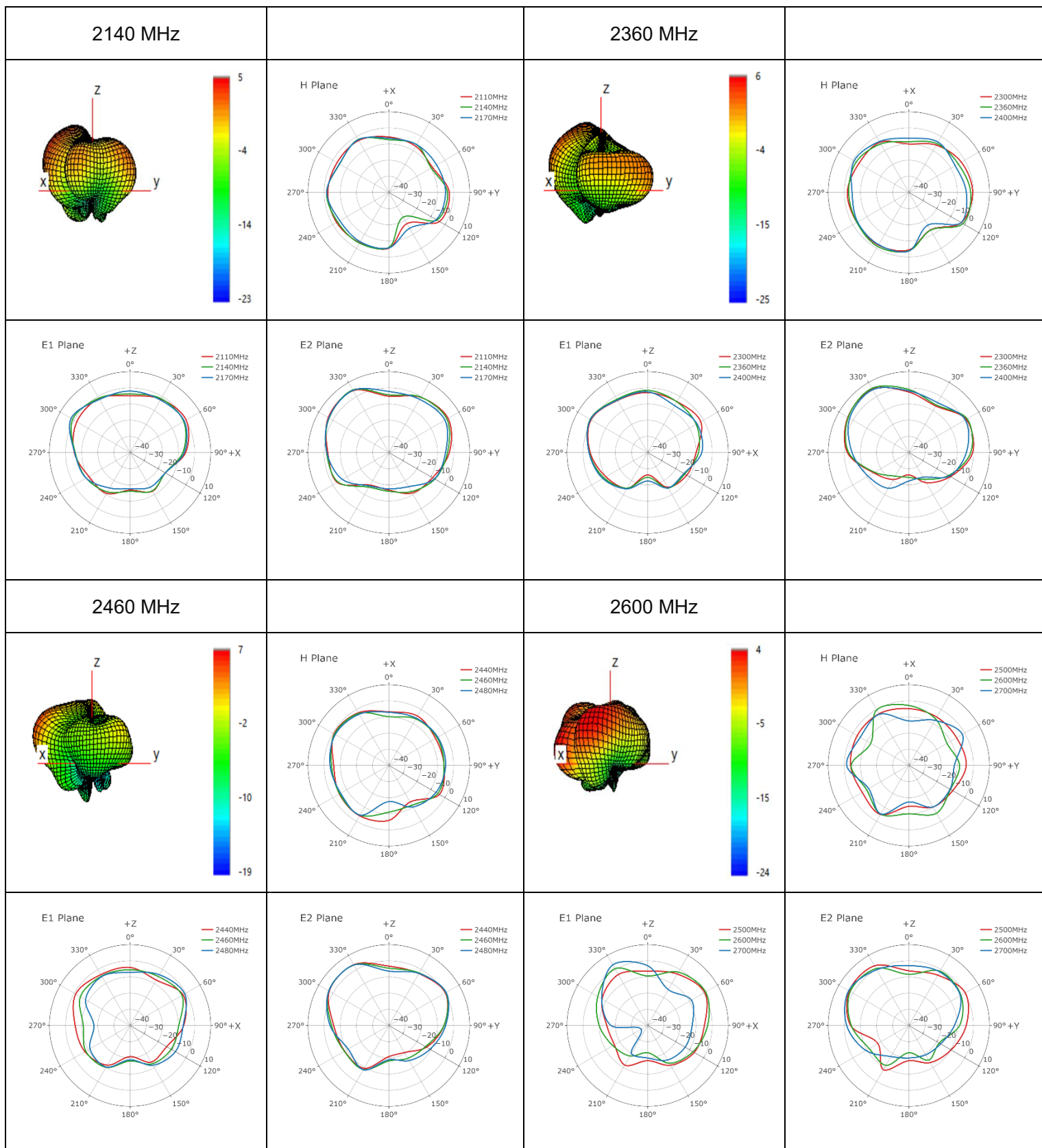
● **MH3**



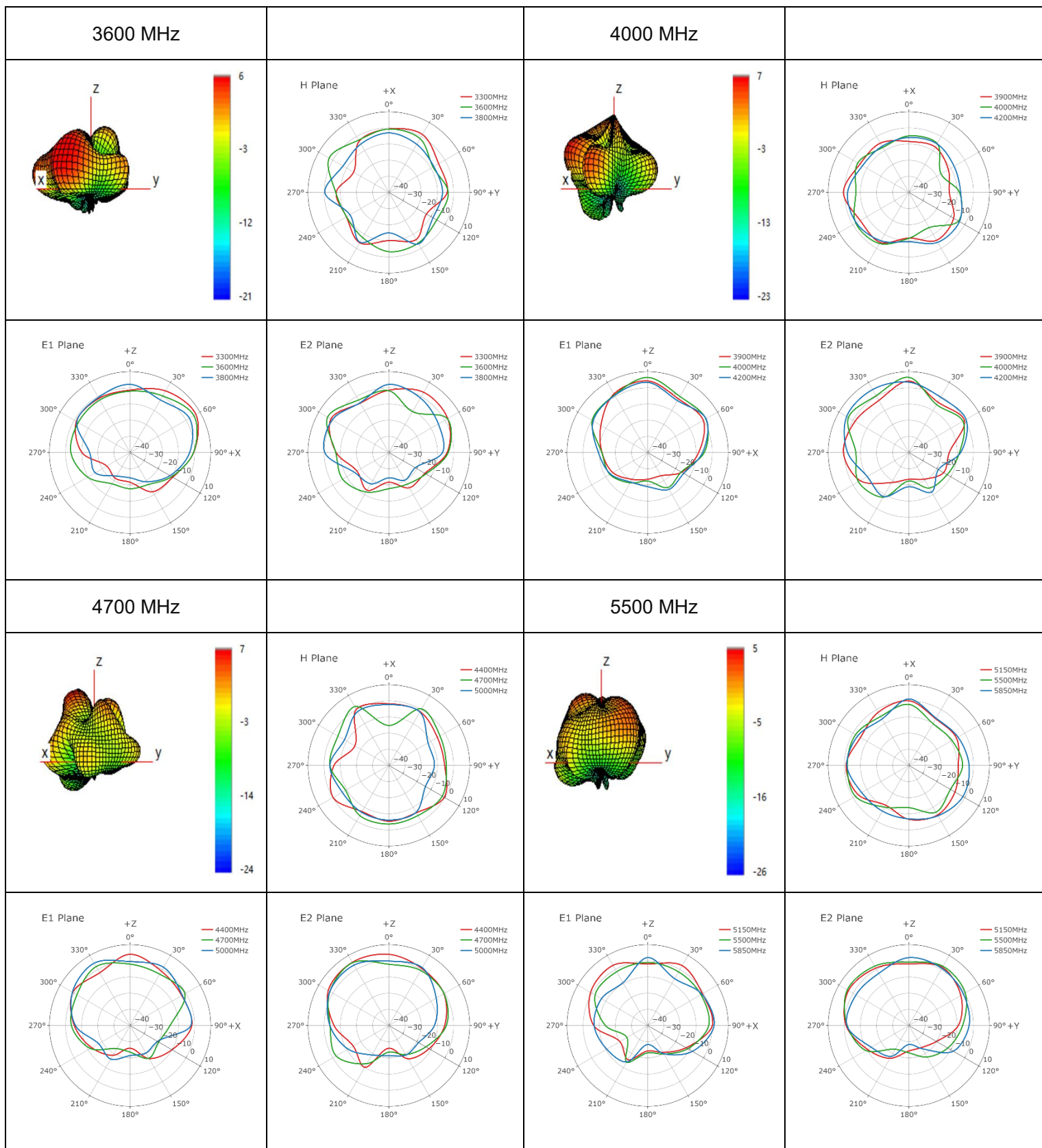
● **MH4**



● **MH4**

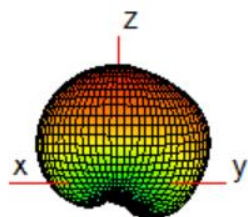


● **MH4**

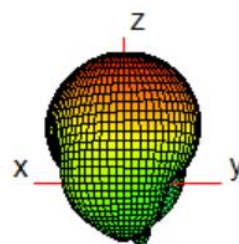


● **GNSS**

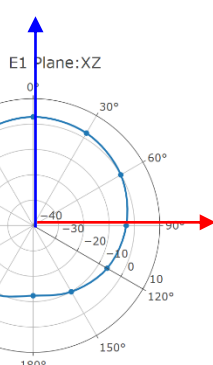
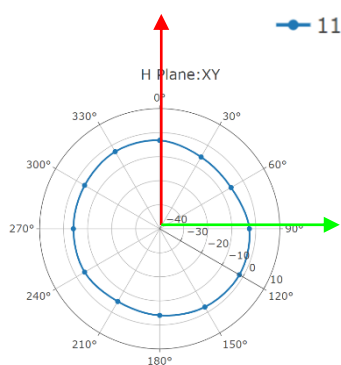
1176 MHz



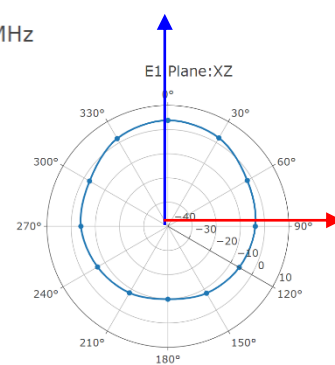
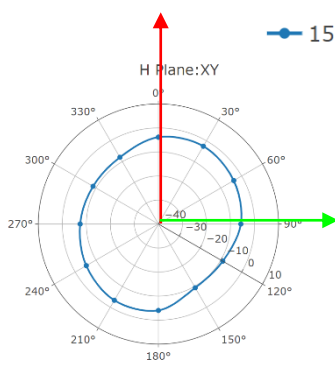
1561 MHz



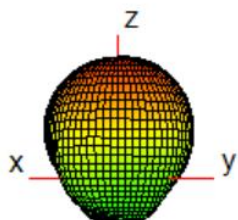
— 1176MHz



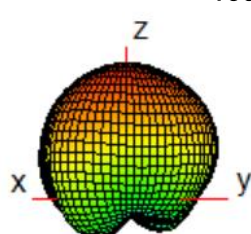
— 1561MHz



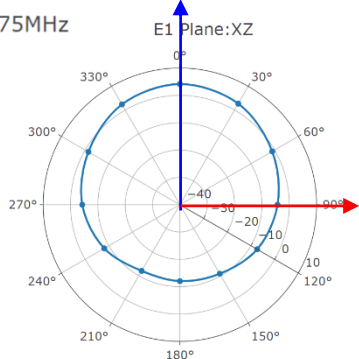
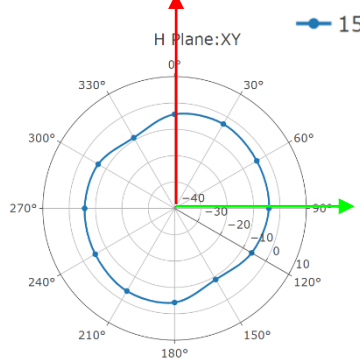
1575 MHz



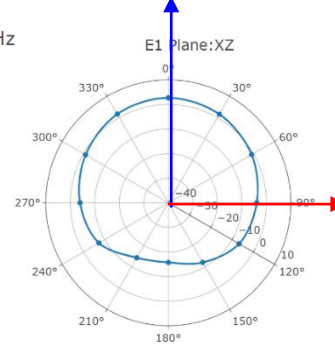
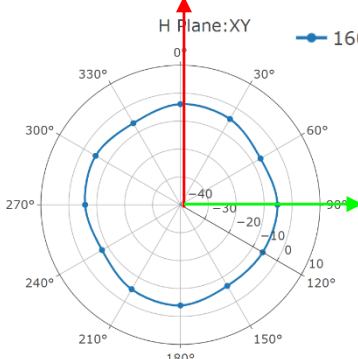
1602 MHz



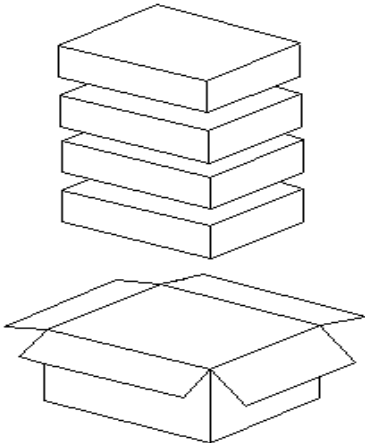
— 1575MHz

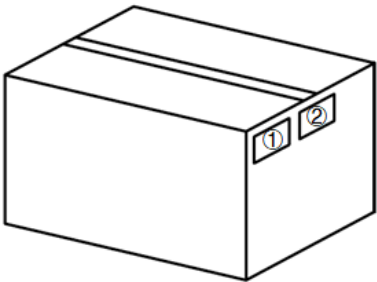
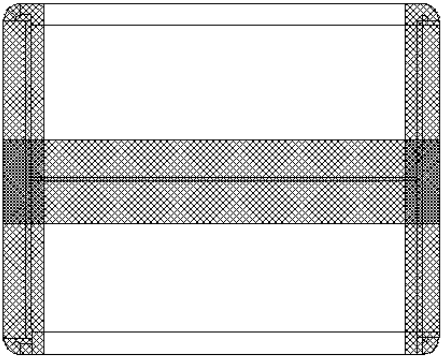


— 1602MHz



4 Packaging

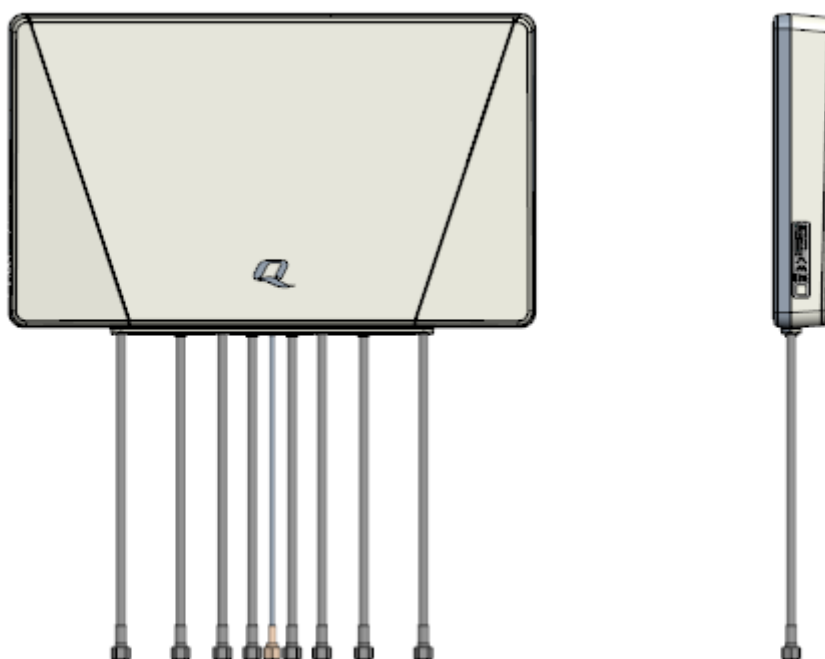
Step	Packaging Picture / 2D Picture	Description
1		Put the product with a bubble bag into the inner box. The bottom of the inner box is placed a bubble bag.
2		Inner Box <u>Pizza Box Size:</u> $L \times W \times H = 350 \times 350 \times 70 \text{ mm}$
3		Place pizza boxes in the outer box and stack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

4		Position for Attaching Labels ① Carton Label ② Quality Label
5		Sealing Cartons H-shaped sealing cartons

5 Installation

YEMA013AA

- LMHs and MHs can be connected arbitrarily.
- Adhesive: Remove the centrifugal paper and attach the antenna to a clean and smooth surface (no oil stains on the attached surface).



Installation Instructions					
Tube Mark	Tube Color	Cable	Connector	Frequency (MHz)	Technology
5G LMH1	Red	ALSR200	SMA Male	600–960 MHz, 1400–6000 MHz	5G/4G/3G/2G
5G LMH2	Red	ALSR200	SMA Male	600–960 MHz, 1400–6000 MHz	5G/4G/3G/2G
5G LMH3	Red	ALSR200	SMA Male	600–960 MHz, 1400–6000 MHz	5G/4G/3G/2G
5G LMH4	Red	ALSR200	SMA Male	600–960 MHz, 1400–6000 MHz	5G/4G/3G/2G

5G MH1	Black	ALSR200	SMA Male	1400–6000 MHz	5G MIMO/Wi-Fi
5G MH2	Black	ALSR200	SMA-M	1400–6000 MHz	5G MIMO/Wi-Fi
5G MH3	Black	ALSR200	SMA-M	1400–6000 MHz	5G MIMO/Wi-Fi
5G MH4	Black	ALSR200	SMA-M	1400–6000 MHz	5G MIMO/Wi-Fi
GNSS	Blue	RG174	SMA-M	1164–1189 MHz, 1559–1606 MHz	GPS/GLONASS/GALILEO/ BEIDOU/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
ECC	Envelope Correlation Coefficient
ECE R118	UN Regulation No.118 (ECE R118-approved cables are flame-resistant cables)

Contact Us

At Quectel, our aim is to provide timely and comprehensive services to our customers. If you require any assistance, please contact our headquarters:

Quectel Wireless Solutions Co., Ltd.

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

Tel: +86 21 5108 6236

Email: info@quectel.com

Or our local offices. For more information, please visit:

[http: www.quectel.com-support-sales.htm](http://www.quectel.com-support-sales.htm)

For technical support, or to report documentation errors, please visit:

[http: www.quectel.com-support-technical.htm](http://www.quectel.com-support-technical.htm)

Or email us at: support@quectel.com

Legal Notices

We offer information as a service to you. The provided information is based on your requirements and we make every effort to ensure its quality. You agree that you are responsible for using independent analysis and evaluation in designing intended products, and we provide reference designs for illustrative purposes only. Before using any hardware, software or service guided by this document, please read this notice carefully. Even though we employ commercially reasonable efforts to provide the best possible experience, you hereby acknowledge and agree that this document and related services hereunder are provided to you on an “as available” basis. We may revise or restate this document from time to time at our sole discretion without any prior notice to you.

Use and Disclosure Restrictions

License Agreements

Documents and information provided by us shall be kept confidential, unless specific permission is granted. They shall not be accessed or used for any purpose except as expressly provided herein.

Copyright

Our and third-party products hereunder may contain copyrighted material. Such copyrighted material shall not be copied, reproduced, distributed, merged, published, translated, or modified without prior written consent. We and the third party have exclusive rights over copyrighted material. No license shall be granted or conveyed under any patents, copyrights, trademarks, or service mark rights. To avoid ambiguities, purchasing in any form cannot be deemed as granting a license other than the normal non-exclusive, royalty-free license to use the material. We reserve the right to take legal action for noncompliance with abovementioned requirements, unauthorized use, or other illegal or malicious use of the material.

Trademarks

Except as otherwise set forth herein, nothing in this document shall be construed as conferring any rights to use any trademark, trade name or name, abbreviation, or counterfeit product thereof owned by Quectel or any third party in advertising, publicity, or other aspects.

Third-Party Rights

This document may refer to hardware, software and-or documentation owned by one or more third parties (“third-party materials”). Use of such third-party materials shall be governed by all restrictions and obligations applicable thereto.

We make no warranty or representation, either express or implied, regarding the third-party materials, including but not limited to any implied or statutory, warranties of merchantability or fitness for a particular purpose, quiet enjoyment, system integration, information accuracy, and non-infringement of any third-party intellectual property rights with regard to the licensed technology or use thereof. Nothing herein constitutes a representation or warranty by us to either develop, enhance, modify, distribute, market, sell, offer for sale, or otherwise maintain production of any our products or any other hardware, software, device, tool, information, or product. We moreover disclaim any and all warranties arising from the course of dealing or usage of trade.

Privacy Policy

To implement module functionality, certain device data are uploaded to Quectel's or third-party's servers, including carriers, chipset suppliers or customer-designated servers. Quectel, strictly abiding by the relevant laws and regulations, shall retain, use, disclose or otherwise process relevant data for the purpose of performing the service only or as permitted by applicable laws. Before data interaction with third parties, please be informed of their privacy and data security policy.

Disclaimer

- a) We acknowledge no liability for any injury or damage arising from the reliance upon the information.
- b) We shall bear no liability resulting from any inaccuracies or omissions, or from the use of the information contained herein.
- c) While we have made every effort to ensure that the functions and features under development are free from errors, it is possible that they could contain errors, inaccuracies, and omissions. Unless otherwise provided by valid agreement, we make no warranties of any kind, either implied or express, and exclude all liability for any loss or damage suffered in connection with the use of features and functions under development, to the maximum extent permitted by law, regardless of whether such loss or damage may have been foreseeable.
- d) We are not responsible for the accessibility, safety, accuracy, availability, legality, or completeness of information, advertising, commercial offers, products, services, and materials on third-party websites and third-party resources.

Copyright © Quectel Wireless Solutions Co., Ltd. 2024. All rights reserved.

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.
2.1	2024-06-25	Steven MO/ Rainey LIAO	- Updated the product name. - Updated the overview. - Add related products OC (Chapter 4). - Added Chapters 5 and 6.
2.2	2024-11-25	Rainey LIAO	Updated typical applications in the overview.



www.quectel.com