



Antenna Datasheet

Product OC: YEMN926J1A

Version: 1.0

Date: 2023-05-29

Status: Preliminary

Product Name: 5G Screw Mount 9 IN 1 Antenna Box

Key Features:

Optimized for 5G and 4G Networks, GNSS L1 & L5

Dimensions: Φ 167 * 57 mm

RoHS and REACH Compliant

IP67 & IP69K

Overview

This ultra-wide-band 5G/4G antenna box provides broad coverage from 600-6000MHz whilst backward-compatible to support 3G/2G networks as well as Cat-M and NB-IoT. The antenna is designed to work with various GND plane sizes or in free space for ease of integration via 9 cables with various lengths between 300-5000mm, terminated with SMA connectors. This screw mount omnidirectional antenna is easy to install with maximum durability with its IP69 KIBILAC® ASA enclosure. It is compatible with Quectel's RM520x Series modules. Quectel provides comprehensive antenna design support such as simulation, testing and manufacturing for custom antenna solutions to meet your specific application needs.

Contents

Overview.....	2
Contents	3
1 Specification.....	4
1.1. Electrical.....	4
1.1.1. LMHs	5
1.1.2. MHs	6
1.1.3. GNSS	7
1.2. Supported Bands	8
1.3. Mechanical, Environment & Storage	11
1.4. Block Diagram (Active Antenna).....	12
2 Drawing	13
3 Detail 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	29
3.1.5. GNSS LNA Gain.....	30
3.1.6. GNSS Noise Figure.....	31
3.2. Radiation Performance Test.....	32
3.2.1. Efficiency	32
3.2.2. Average Gain	35
3.2.3. Peak Gain.....	38
3.2.4. GNSS 2D RHCP and LHCP Gain	41
3.2.5. 3D & 2D Radiation Pattern.....	42
3.2.5.1. Test Status: In Free Space	42
3.2.5.2. Test Status: On 300 × 400 mm Metal Plane	66
3.3. Active OTA Test.....	90
4 Packaging	94
Contact US	96
Legal Notices	97
Revision History	99

1 Specification

1.1. Electrical

Test Condition: In Free Space & On 500 × 500 mm Metal Plane

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		≤ -6.7 dB
Axial Ratio (GNSS)		< 3 dB

1.1.1. LMHs

SPEC	Band	B71	B12 /B13 /B28	B5 /B8 /B26	N74 /N75 /N76	B1 /B2 /B3	B40	Wi-Fi 2G	B38 /B41	B42 /B48 /N77	N79	Wi-Fi 5G
	Freq. (MHz)	600– 700	700– 810	820– 960	1420– 1520	1700– 2170	2300– 2400	2400– 2500	2500– 2690	3300– 4200	4400– 5000	5150– 5850
Max VSWR	FS	4.3	3.0	3.0	7.0	3.0	1.6	2.3	3.6	3.0	2.6	2.1
	MP	3.4	2.0	2.6	6.3	2.8	1.5	2.3	3.6	3.1	2.2	2.1
Max Return Loss (dB)	FS	-4.1	-6.0	-6.0	-2.5	-6.0	-12.7	-8.1	-4.9	-6.0	-6.9	-8.9
	MP	-5.2	-9.4	-6.9	-2.8	-6.4	-13.6	-8.2	-5.0	-5.8	-8.7	-9.1
AVG Eff. (%)	FS	35.7	52.5	47.5	30.7	65.0	64.9	64.5	50.6	62.9	63.0	54.2
	MP	19.7	32.7	29.4	32.9	59.9	59.5	62.3	46.1	59.5	54.8	41.6
AVG Gain (dB)	FS	-4.5	-2.8	-3.2	-5.1	-1.9	-1.9	-1.9	-3.0	-2.0	-2.0	-2.7
	MP	-7.1	-4.9	-5.3	-4.8	-2.2	-2.3	-2.1	-3.4	-2.3	-2.6	-3.8
Max Peak Gain (dBi)	FS	0.2	1.8	1.3	-0.2	4.4	2.4	2.5	2.4	5.6	5.7	4.4
	MP	0.9	4.1	4.3	3.2	7.3	5.5	5.4	4.2	6.9	6.0	5.0
VSWR	FS	≤ 7.0										
	MP	≤ 6.3										
Return Loss	FS	≤ -2.5 dB										
	MP	≤ -2.8 dB										
Peak Gain	FS	≤ 5.7 dBi										
	MP	≤ 7.3 dBi										

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

1.1.2. MHs

SPEC	Band	B71	B12 /B13 /B28	B5 /B8 /B26	N74 /N75 /N76	B1 /B2 /B3	B40	Wi-Fi 2G	B38 /B41	B42 /B48 /N77	N79	Wi-Fi 5G
	Freq. (MHz)	600– 700	700– 810	820– 960	1420– 1520	1700– 2170	2300– 2400	2400– 2500	2500– 2690	3300– 4200	4400– 5000	5150– 5850
Max VSWR	FS	-	-	-	8.3	3.9	2.4	2.5	1.9	3.1	3.0	2.6
	MP	-	-	-	5.3	2.7	2.3	3.1	2.5	2.6	3.3	2.7
Max Return Loss (dB)	FS	-	-	-	-2.1	-4.6	-7.8	-7.3	-10.4	-5.8	-6.1	-6.9
	MP	-	-	-	-3.3	-6.7	-8.2	-5.8	-7.5	-7.0	-5.5	-6.8
AVG Eff. (%)	FS	-	-	-	39.9	65.3	54.4	57.6	58.0	68.0	56.4	49.0
	MP	-	-	-	22.5	56.3	48.7	51.6	53.7	66.6	54.7	50.7
AVG Gain (dB)	FS	-	-	-	-4.0	-1.9	-2.6	-2.4	-2.4	-1.7	-2.5	-3.1
	MP	-	-	-	-6.5	-2.5	-3.1	-2.9	-2.7	-1.8	-2.6	-2.9
Max Peak Gain (dBi)	FS	-	-	-	1.0	3.8	1.7	2.6	3.7	5.5	5.1	5.8
	MP	-	-	-	1.7	6.4	5.2	4.9	5.6	7.2	6.1	8.2
VSWR	FS	≤ 8.3										
	MP	≤ 5.3										
Return Loss	FS	≤ -2.1 dB										
	MP	≤ -3.3 dB										
Peak Gain	FS	≤ 5.8 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

Band Frequency (MHz)	GPS L5 GALILEO E5a BEIDOU B2a- B2I QZSS L5 IRNSS L5	GALILEO E5b BEIDOU B2b	GPS L2 QZSS L2C	GLONASS G2	BEIDOU B3	BEIDOU B1I	GPS L1 GALILEO E1 BEIDOU B1C QZSS L1	GLONASS G1
	1176	1207	1227	1248	1268	1561	1575	1602
VSWR	1.48	-	-	-	-	1.63	1.54	1.42
Return Loss (dB)	-14.2	-	-	-	-	-12.3	13.4	-15.2
Efficiency (%)	85	-	-	-	-	53	66	45.6
AVG Gain (dB)	-0.9	-	-	-	-	-3.37	-2.47	-4.03
Peak Gain (dBi)	4.79	-	-	-	-	2.88	3.84	2.26
Axial Ratio(dB)	2.44	-	-	-	-	1.2	0.79	0.77

LNA Electrical	
LNA Gain	22±2 dB
Noise Figure	≤ 2.5dB
Output VSWR	< 2.0
Filter Out-of-Band Attenuation	60 dB f0 ±100 MHz f0 (1164-1189 MHz, 1559-1606 MHz)
Working Voltage	3-6.5 V
Working Current	18.8±3 mA
Impedance	50 Ω

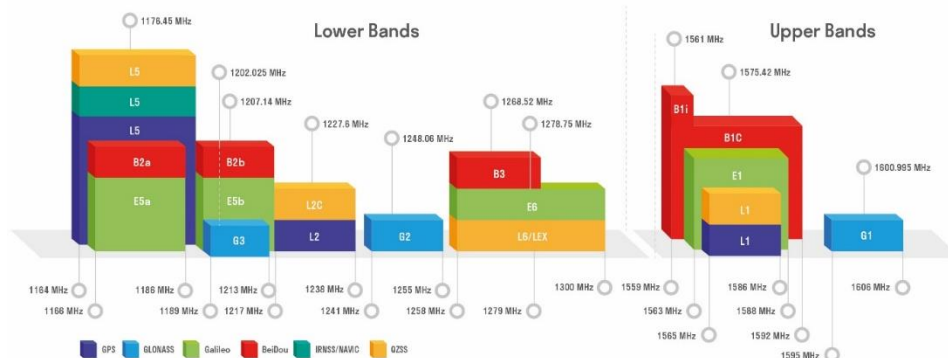
1.2. Supported Bands

5G NR/ LTE/ LTE-Advanced/ WCDMA/ HSPA/ HSPA+/ GPRS/ GSM/ NB-IoT					
Band	Frequency (MHz)	Uplink (MHz)	Downlink (MHz)	LMHs	MHs
1	2100	1920–1980	2110–2170	√	√
2	1900	1850–1910	1930–1990	√	√
3	1800	1710–1785	1805–1880	√	√
4	1700	1710–1755	2110–2155	√	√
5	850	824–849	869–894	√	-
7	2600	2500–2570	2620–2690	√	√
8	900	880–915	925–960	√	-
9	1800	1749.9–1784.9	1844.9–1879.9	√	√
11	1500	1427.9–1447.9	1475.9–1495.9	-	√
12	700	699–716	729–746	√	-
13	700	777–787	746–756	√	-
14	700	788–798	758–768	√	-
17	700	704–716	734–746	√	-
18	850	815–830	860–875	√	-
19	850	830–845	875–890	√	-
20	800	832–862	791–821	√	-
21	1500	1447.9–1462.9	1495.9–1510.9	-	√
22	3500	3410–3490	3510–3590	√	√
23	2100	2000–2020	2180–2200	√	√
24	1600	1626.5–1660.5	1525–1559		√
25	1900	1850–1915	1930–1995	√	√
26	850	814–849	859–894	√	-

5G NR/ LTE/ LTE-Advanced/ WCDMA/ HSPA/ HSPA+/ GPRS/ GSM/ NB-IoT					
Band	Frequency (MHz)	Uplink (MHz)	Downlink (MHz)	LMHs	MHs
28	700	703-748	758-803	√	-
31	450	452.5-457.5	462.5 - 467.5	-	-
34	2100	2010 – 2025		√	√
38	2600	2570 - 2620		√	√
39	1900	1880 - 1920		√	√
40	2300	2300 - 2400		√	√
41	2500	2496 - 2690		√	√
42	3500	3400 - 3600		√	√
48	3500	3550 - 3700		√	√
66	1700	1710 - 1780	2110 - 2200	√	√
71	600	663 - 698	617 - 652	√	-
74	1500	1427 - 1470	1475 - 1518	-	√
77	3500	3300 - 4200		√	√
78	3500	3300 - 3800		√	√
79	4500	4400 - 5000		√	√
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

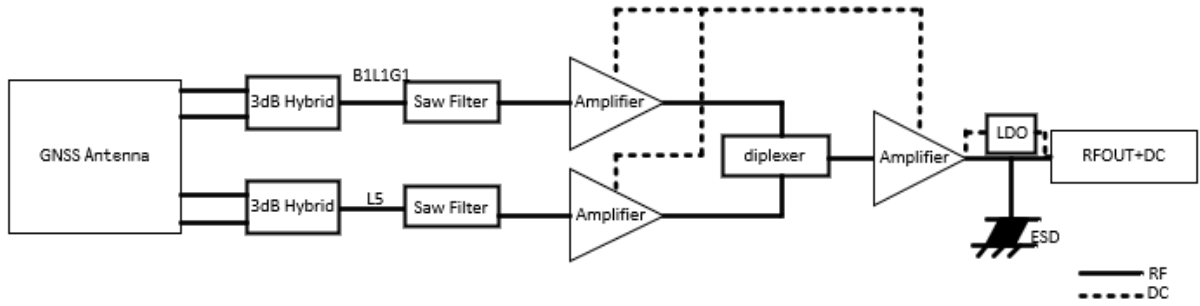


1.3. Mechanical, Environment & Storage

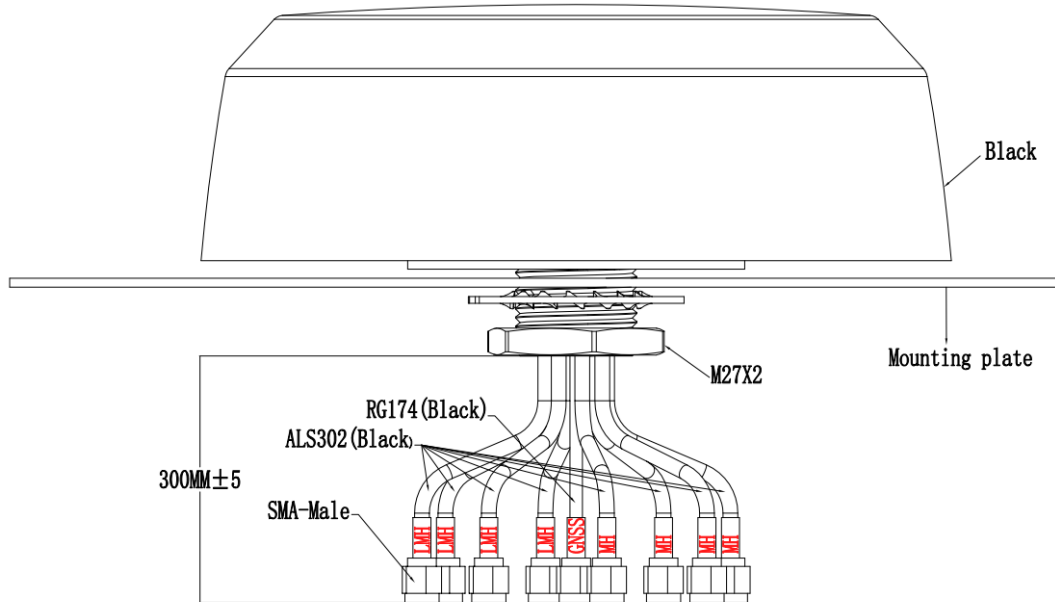
Mechanical		
Antenna Size	Φ 167 * 57 mm	
Casing Material & Color	ASA & Black	
Cable Type & Length	LMHs & MHs	ALS302 Black & 300 mm
	GNSS	RG174 Black & 300 mm
Connector Type	SMA Male	
Weight	Typ. 550 g	
Mounting Type	Screw (M27 Nut)	
Environmental		
Operation Temperature	-40 °C to +85 °C	
Ingress Protection (IP) Rating	IP67 (After Installation) IP69K (After Installation)	
Impact Protection (IK) Rating	IK09	
RoHS & REACH Compliant	Yes	
Storage		
Storage Temperature	18°C -27°C	
Humidity	30%-80%RH	
Storage Place	Away from corrosive gas and direct sunlight	
Packing	Antennas should be stored in unopened sealed manufacturer's plastic packaging	

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

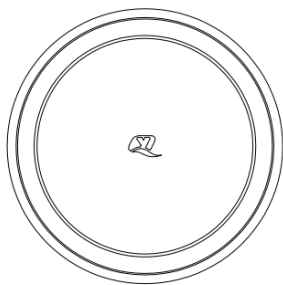
1.4. Block Diagram (Active Antenna)



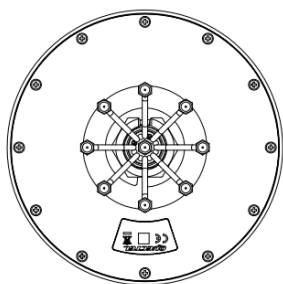
2 Drawing



- 4 LMHs can be connected arbitrarily, and 4 MHs can be connected arbitrarily.
- Recommended assembly hole diameter: 28.0 mm.
- Recommended mounting plane thickness: 3.0 mm.



Top View



Bottom View

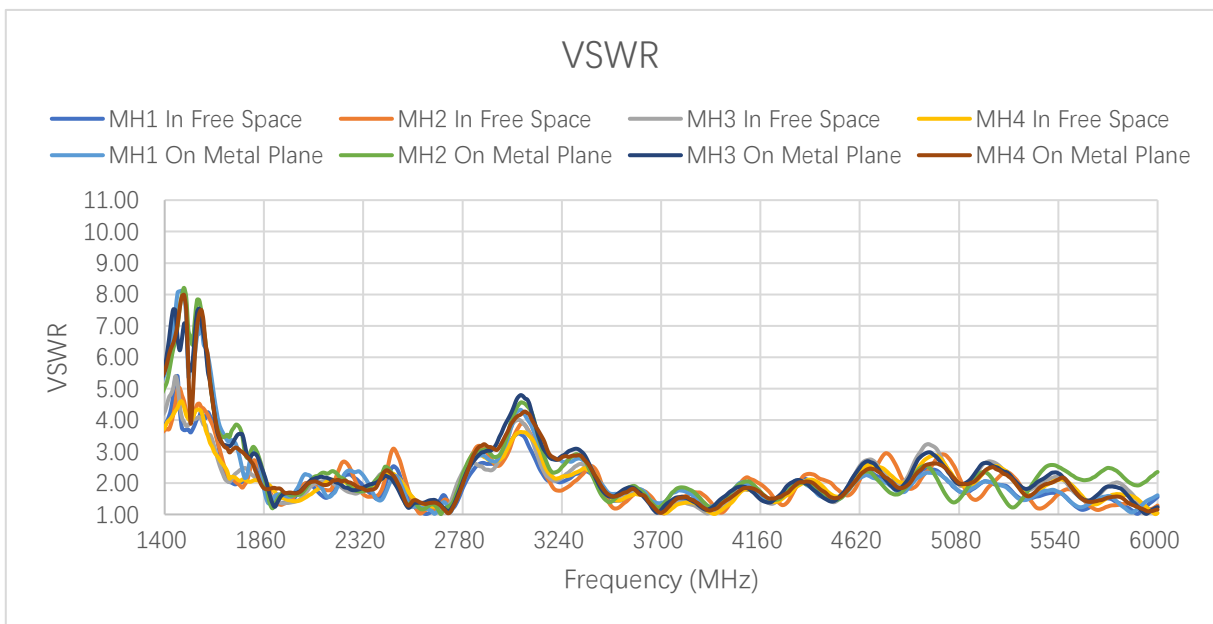
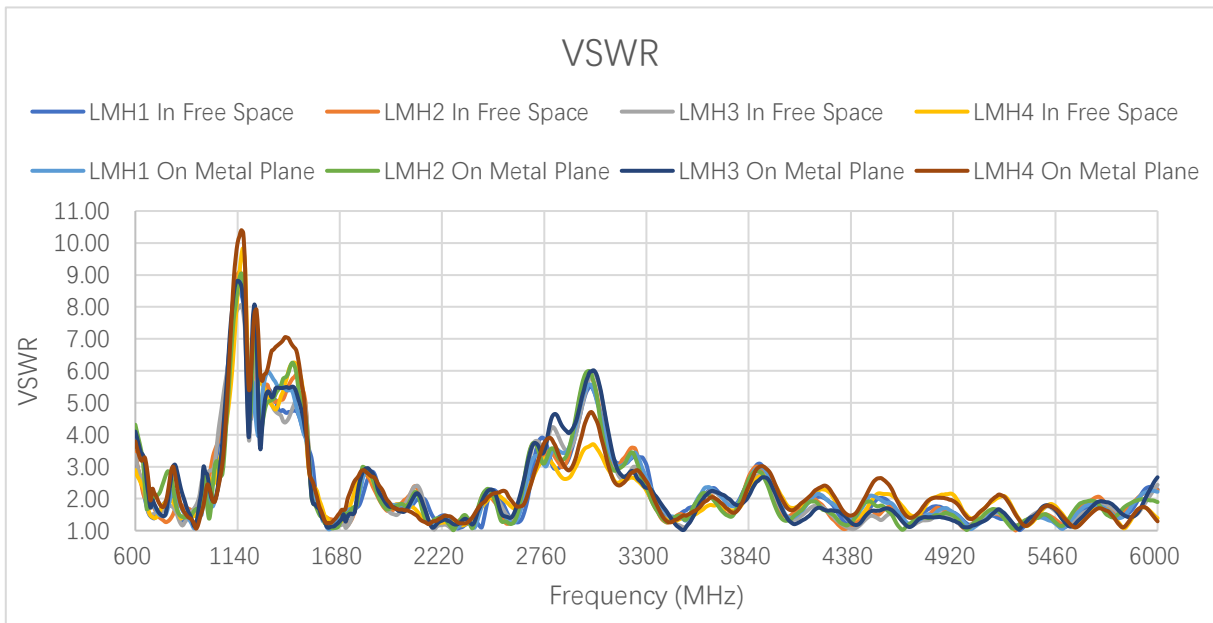


SMA

3 Detail Performance

3.1. S-Parameter Test

3.1.1. VSWR



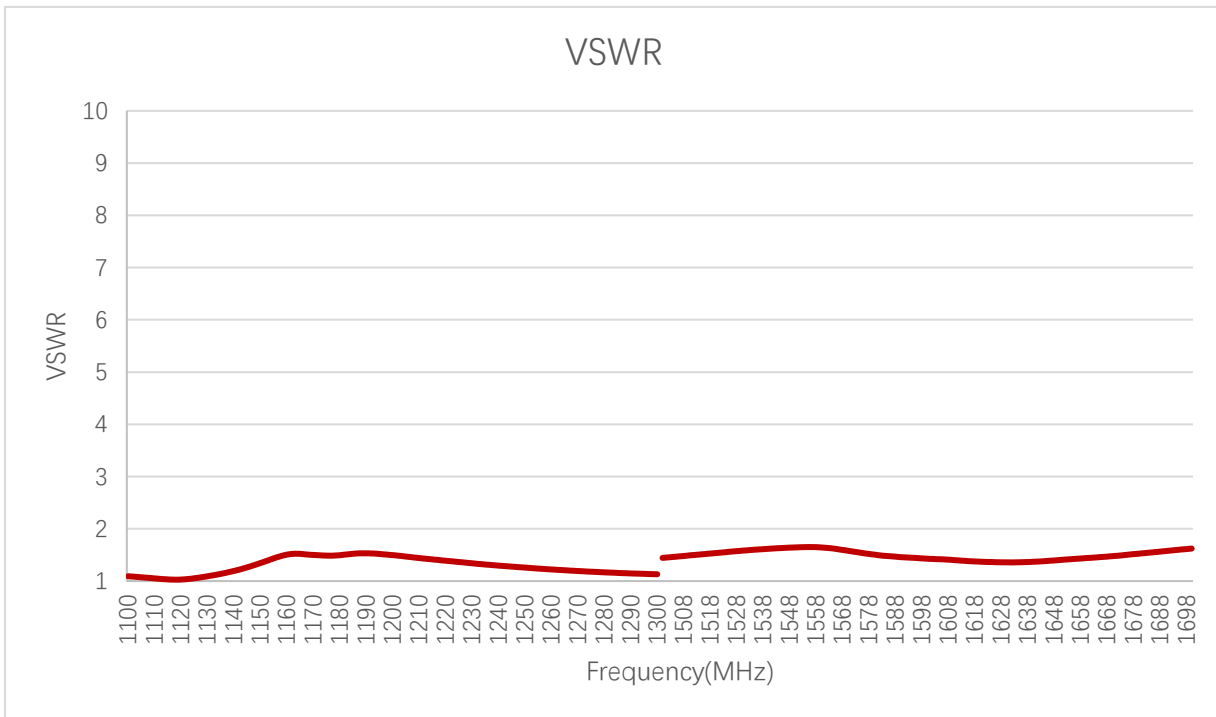
VSWR - LMH

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	3.3	2.5	1.5	1.4	1.6	2.4	4.8	1.3	1.5	2.5
	MP	4.0	3.4	1.7	1.9	1.2	2.0	5.1	1.4	1.7	2.3
LMH2	FS	3.5	2.5	1.6	1.8	1.6	2.3	5.8	1.2	1.3	2.1
	MP	4.3	3.5	2.1	1.5	1.5	2.7	6.2	1.4	1.6	2.1
LMH3	FS	3.4	2.6	1.5	1.3	1.6	2.6	5.0	1.1	1.3	2.2
	MP	4.1	3.4	1.7	2.6	1.3	3.0	5.5	1.3	1.5	2.3
LMH4	FS	2.9	2.5	1.4	1.5	1.5	2.3	6.3	1.3	1.9	2.3
	MP	3.8	3.2	2.1	2.1	1.3	1.8	6.7	1.7	2.3	2.5
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	1.7	1.9	1.2	1.6	1.3	2.6	1.4	1.2	1.1	2.3
	MP	1.8	1.4	1.3	2.1	1.2	2.3	1.2	1.1	1.1	2.2
LMH2	FS	1.6	1.4	1.3	2.2	1.3	2.1	1.2	1.1	1.2	2.3
	MP	1.7	1.3	1.4	2.3	1.3	2.2	1.3	1.0	1.2	1.9
LMH3	FS	1.5	1.5	1.4	2.1	1.4	2.1	1.2	1.1	1.4	2.4
	MP	1.7	1.5	1.4	2.1	1.5	2.0	1.1	1.1	1.3	2.7
LMH4	FS	1.8	1.2	1.2	1.9	1.7	1.7	1.5	1.4	1.5	1.4
	MP	1.8	1.2	1.2	1.9	1.8	1.9	1.4	1.4	1.4	1.3

VSWR - MH

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	4.8	2.0	2.0	1.6
	MP	-	-	-	-	-	-	6.9	3.4	3.0	1.4
MH2	FS	-	-	-	-	-	-	4.2	2.1	2.0	1.8
	MP	-	-	-	-	-	-	6.3	3.7	3.8	1.6
MH3	FS	-	-	-	-	-	-	5.0	2.1	2.4	1.7
	MP	-	-	-	-	-	-	7.5	3.2	3.5	1.8
MH4	FS	-	-	-	-	-	-	4.2	2.2	2.1	2.0

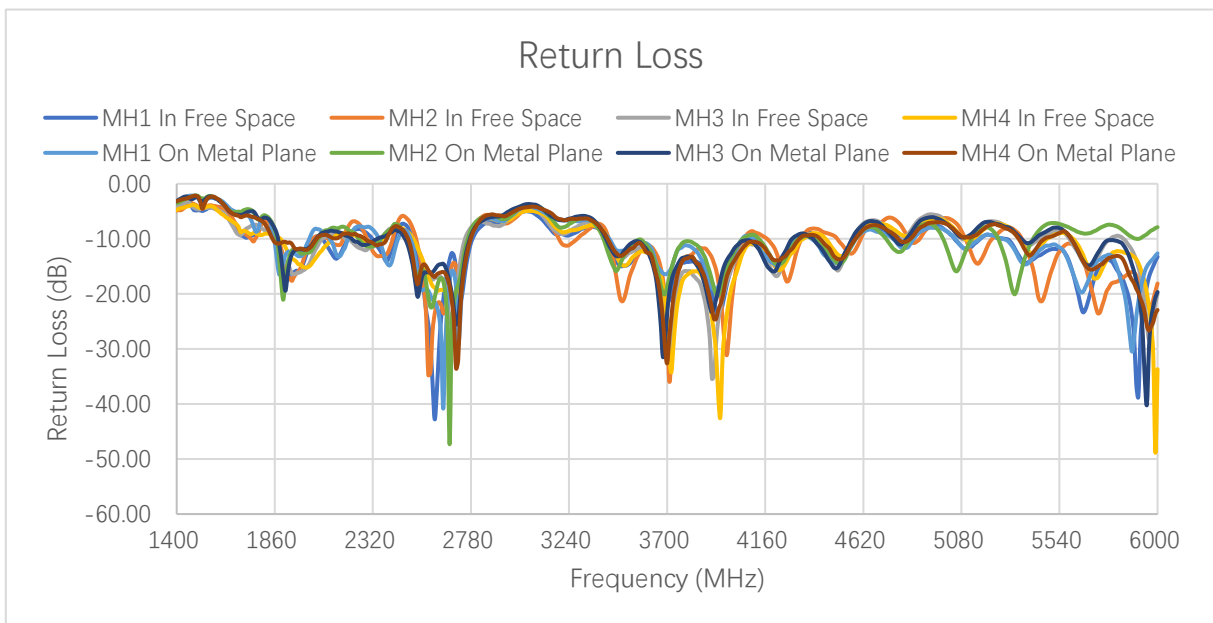
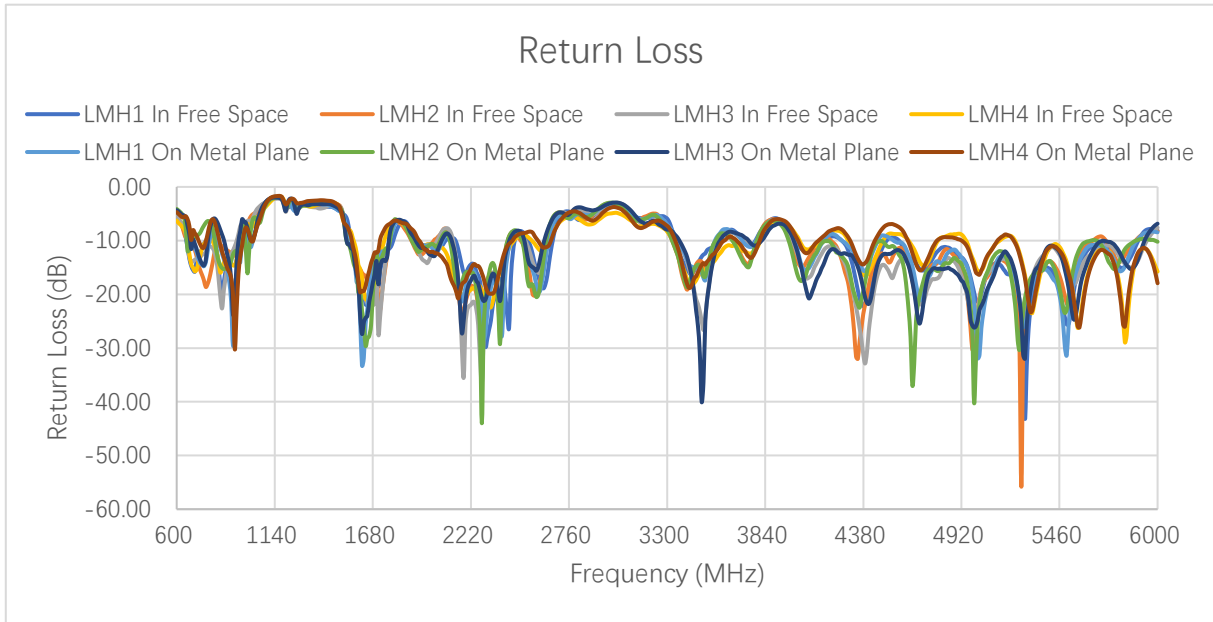
	MP	-	-	-	-	-	-	6.5	3.0	3.1	1.8
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	1.4	1.5	1.7	2.5	1.0	1.8	2.2	2.2	1.7	1.6
	MP	1.6	1.7	1.9	2.1	1.2	1.8	2.1	2.2	1.8	1.6
MH2	FS	1.3	1.8	1.6	3.0	1.1	1.8	2.6	2.9	1.4	1.3
	MP	1.7	2.3	1.9	2.3	1.2	1.8	2.1	1.9	2.6	2.4
MH3	FS	1.4	2.0	1.9	2.3	1.3	1.6	2.6	2.8	2.1	1.2
	MP	1.6	2.2	2.0	2.1	1.4	1.7	2.5	2.6	2.3	1.2
MH4	FS	1.5	2.0	1.8	2.3	1.3	1.6	2.5	2.7	2.0	1.0
	MP	1.7	1.9	1.8	2.3	1.3	1.6	2.4	2.6	2.0	1.2



VSWR-GNSS

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

3.1.2. Return Loss



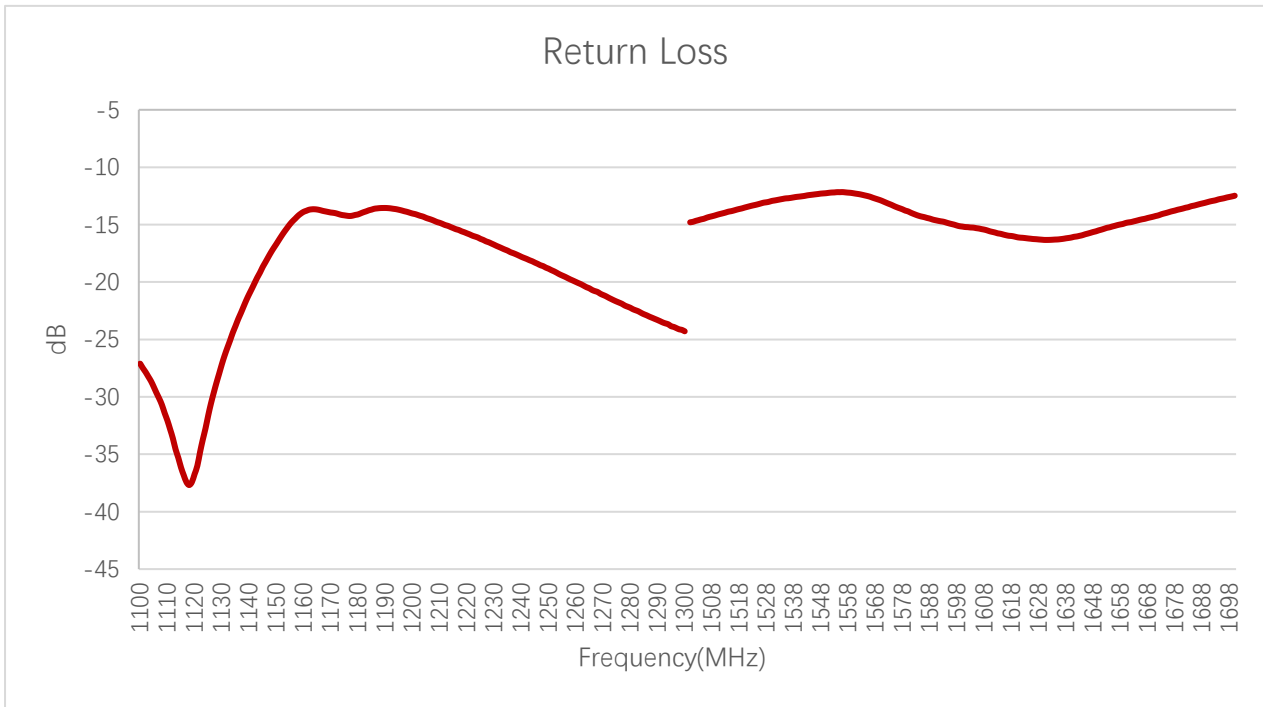
Return Loss (dB)

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	-5.4	-7.4	-14.0	-15.6	-12.7	-7.7	-3.7	-17.7	-14.0	-7.4
	MP	-4.4	-5.3	-11.7	-10.2	-20.8	-9.5	-3.5	-15.6	-11.7	-8.1
LMH2	FS	-5.1	-7.4	-12.7	-10.9	-12.7	-8.1	-3.0	-20.8	-17.7	-9.0
	MP	-4.1	-5.1	-9.0	-14.0	-14.0	-6.8	-2.8	-15.6	-12.7	-9.0
LMH3	FS	-5.3	-7.0	-14.0	-17.7	-12.7	-7.0	-3.5	-26.4	-17.7	-8.5
	MP	-4.3	-5.3	-11.7	-7.0	-17.7	-6.0	-3.2	-17.7	-14.0	-8.1
LMH4	FS	-6.2	-7.4	-15.6	-14.0	-14.0	-8.1	-2.8	-17.7	-10.2	-8.1
	MP	-4.7	-5.6	-9.0	-9.0	-17.7	-10.9	-2.6	-11.7	-8.1	-7.4
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	-11.7	-10.2	-20.8	-12.7	-17.7	-7.0	-15.6	-20.8	-26.4	-8.1
	MP	-10.9	-15.6	-17.7	-9.0	-20.8	-8.1	-20.8	-26.4	-26.4	-8.5
LMH2	FS	-12.7	-15.6	-17.7	-8.5	-17.7	-9.0	-20.8	-26.4	-20.8	-8.1
	MP	-11.7	-17.7	-15.6	-8.1	-17.7	-8.5	-17.7	-32.0	-20.8	-10.2
LMH3	FS	-14.0	-14.0	-15.6	-9.0	-15.6	-9.0	-20.8	-26.4	-15.6	-7.7
	MP	-11.7	-14.0	-15.6	-9.0	-14.0	-9.5	-26.4	-26.4	-17.7	-6.8
LMH4	FS	-10.9	-20.8	-20.8	-10.2	-11.7	-11.7	-14.0	-15.6	-14.0	-15.6
	MP	-10.9	-20.8	-20.8	-10.2	-10.9	-10.2	-15.6	-15.6	-15.6	-17.7

Return Loss(dB)

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	-3.7	-9.5	-9.5	-12.7
	MP	-	-	-	-	-	-	-2.5	-5.3	-6.0	-15.6
MH2	FS	-	-	-	-	-	-	-4.2	-9.0	-9.5	-10.9
	MP	-	-	-	-	-	-	-2.8	-4.8	-4.7	-12.7
MH3	FS	-	-	-	-	-	-	-3.5	-9.0	-7.7	-11.7
	MP	-	-	-	-	-	-	-2.3	-5.6	-5.1	-10.9
MH4	FS	-	-	-	-	-	-	-4.2	-8.5	-9.0	-9.5

	MP	-	-	-	-	-	-	-2.7	-6.0	-5.8	-10.9
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	-15.6	-14.0	-11.7	-7.4	-36.3	-10.9	-8.5	-8.5	-11.7	-12.7
	MP	-12.7	-11.7	-10.2	-9.0	-20.8	-10.9	-9.0	-8.5	-10.9	-12.7
MH2	FS	-17.7	-10.9	-12.7	-6.0	-26.4	-10.9	-7.0	-6.2	-15.6	-17.7
	MP	-11.7	-8.1	-10.2	-8.1	-20.8	-10.9	-9.0	-10.2	-7.0	-7.7
MH3	FS	-15.6	-9.5	-10.2	-8.1	-17.7	-12.7	-7.0	-6.5	-9.0	-20.8
	MP	-12.7	-8.5	-9.5	-9.0	-15.6	-11.7	-7.4	-7.0	-8.1	-20.8
MH4	FS	-14.0	-9.5	-10.9	-8.1	-17.7	-12.7	-7.4	-6.8	-9.5	-33.7
	MP	-11.7	-10.2	-10.9	-8.1	-17.7	-12.7	-7.7	-7.0	-9.5	-20.8



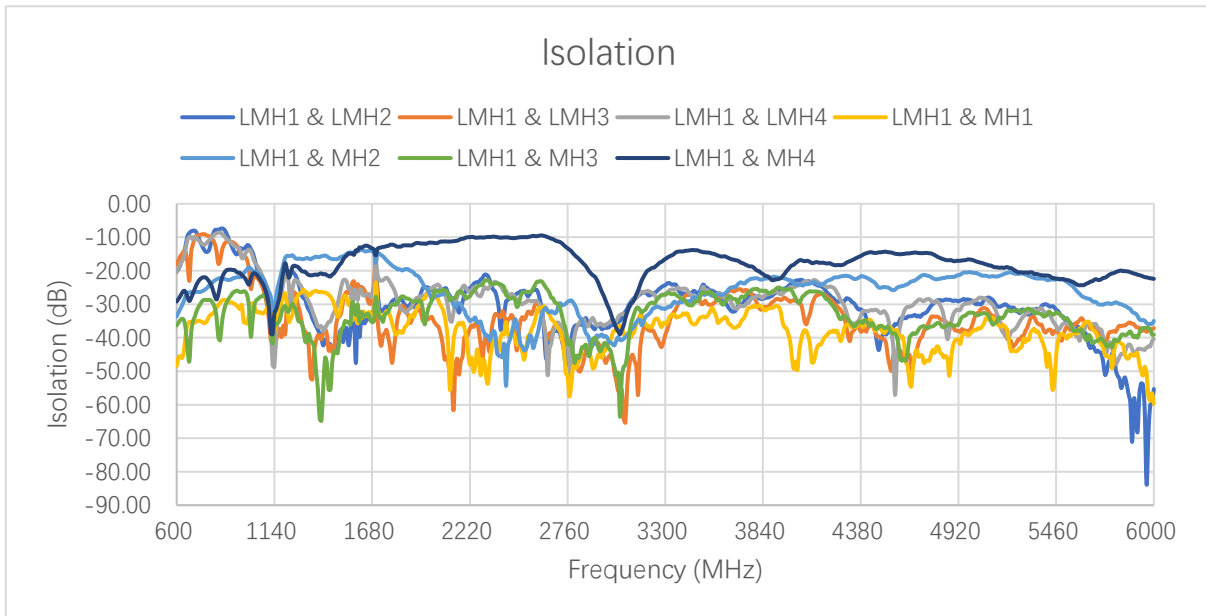
Return Loss(dB)-GNSS

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

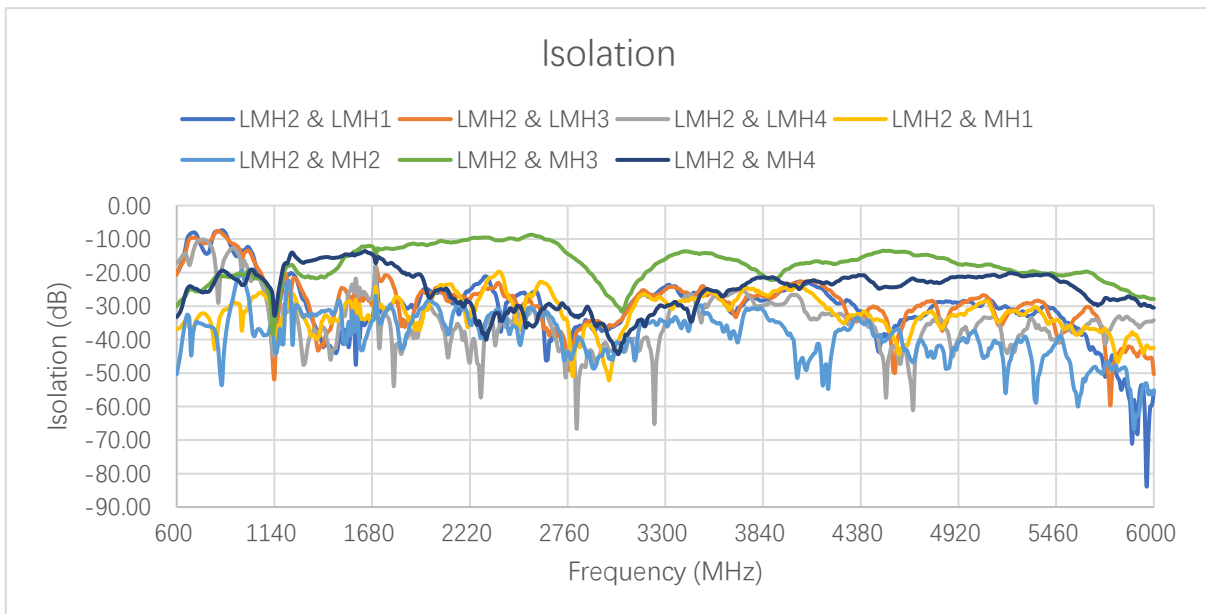
3.1.3. Isolation

3.1.3.1. Test Status: In Free Space

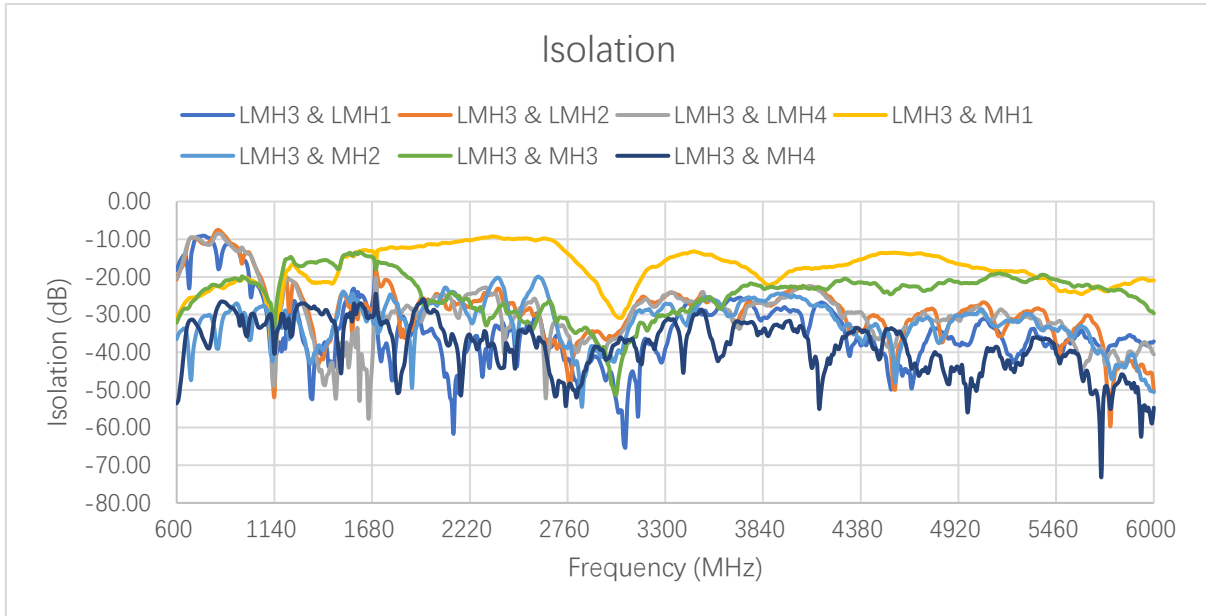
3.1.3.1.1. LMH1



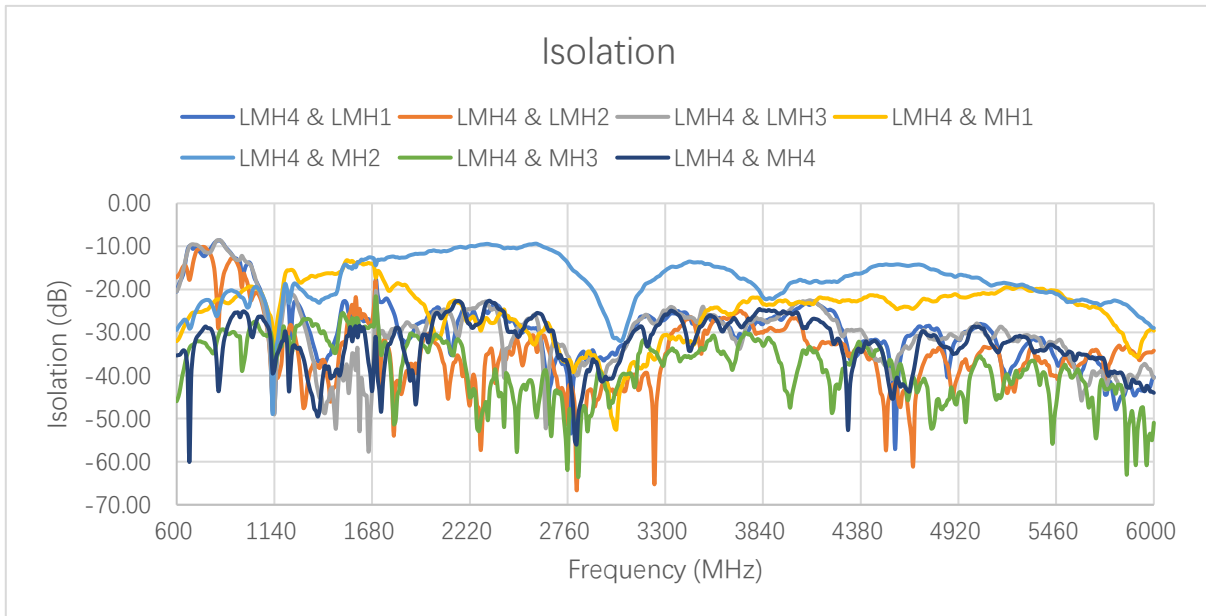
3.1.3.1.2. LMH2



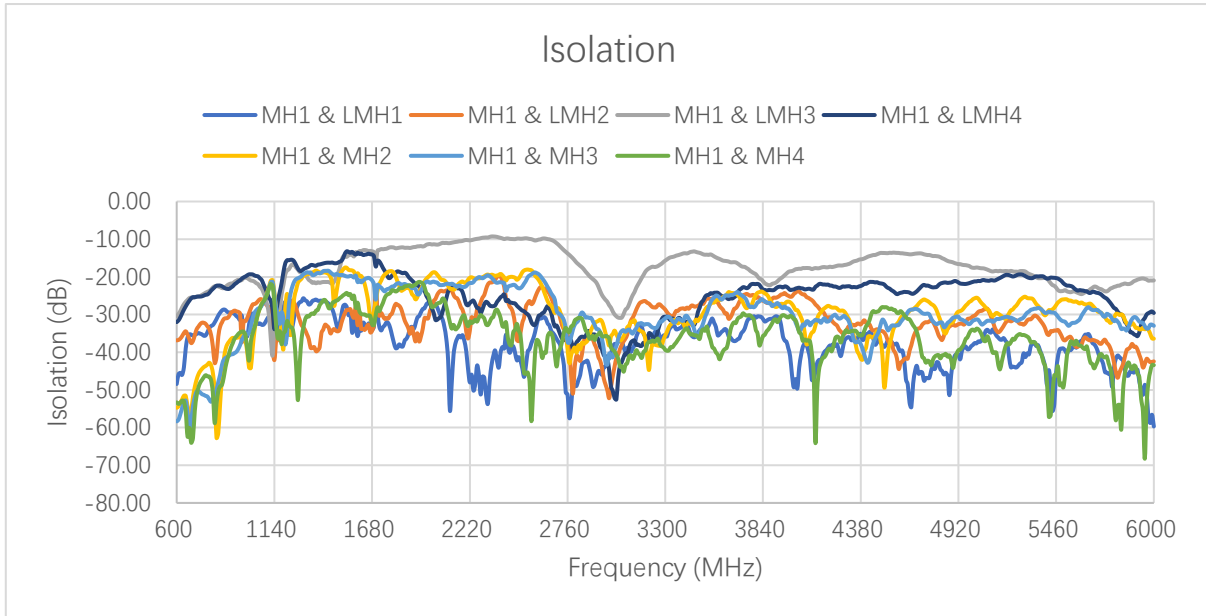
3.1.3.1.3. LMH3



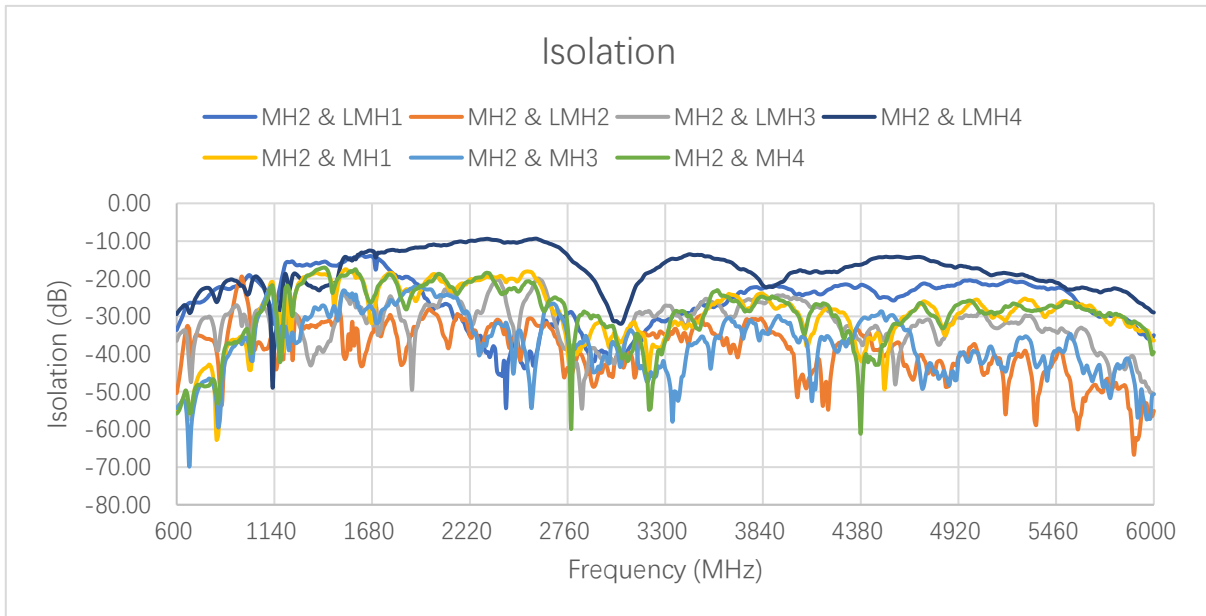
3.1.3.1.4. LMH4



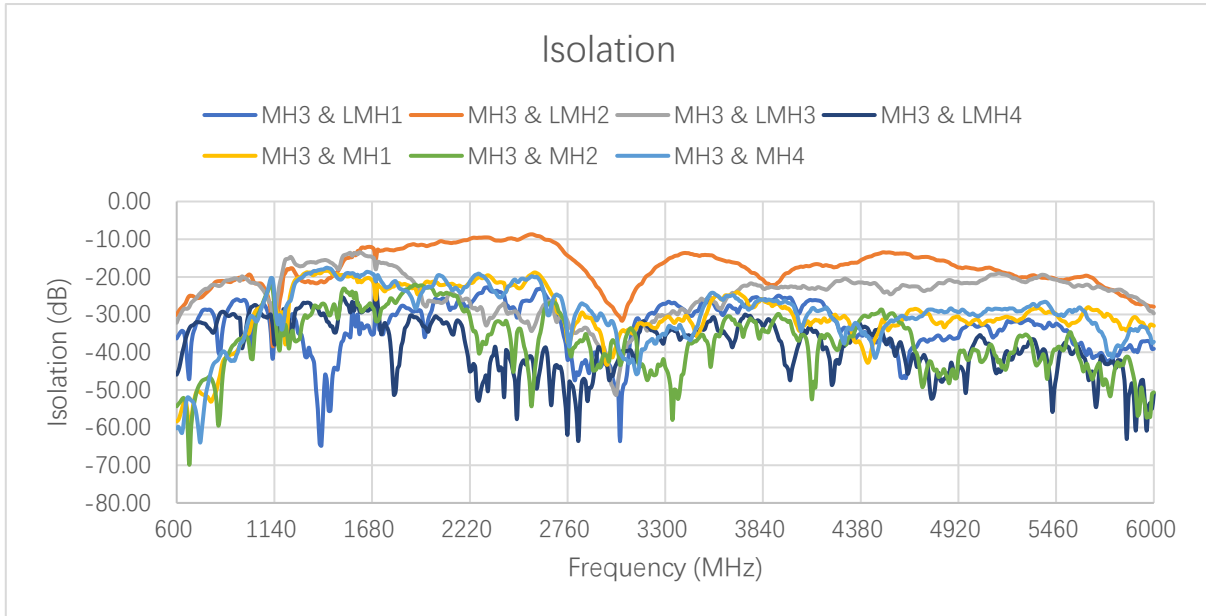
3.1.3.1.5. MH1



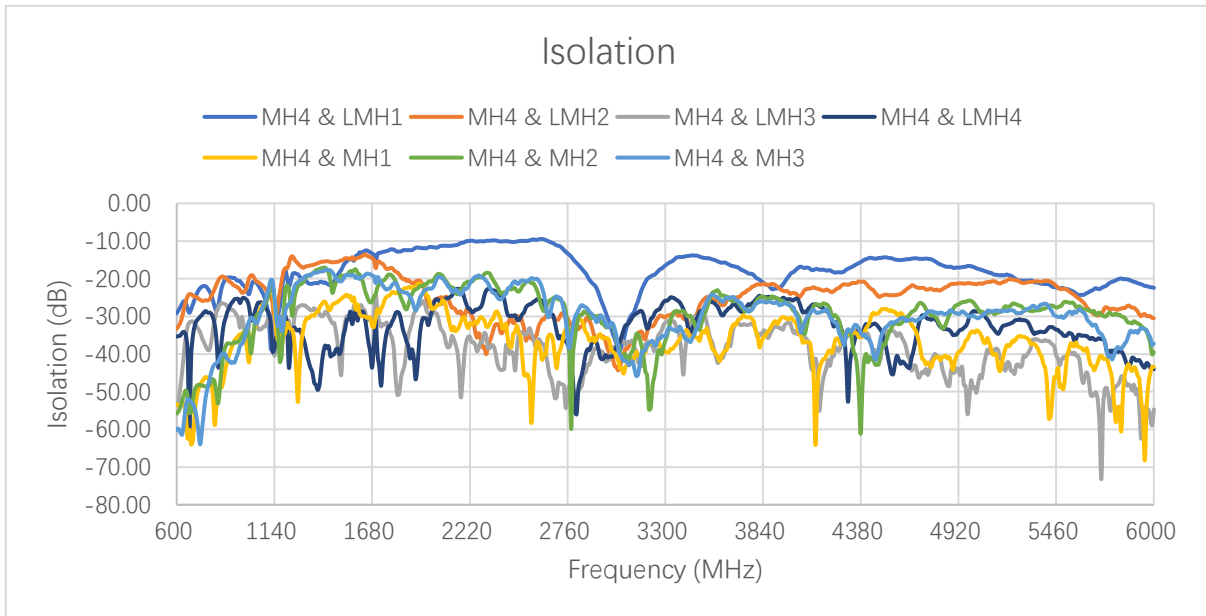
3.1.3.1.6. MH2



3.1.3.1.7. MH3

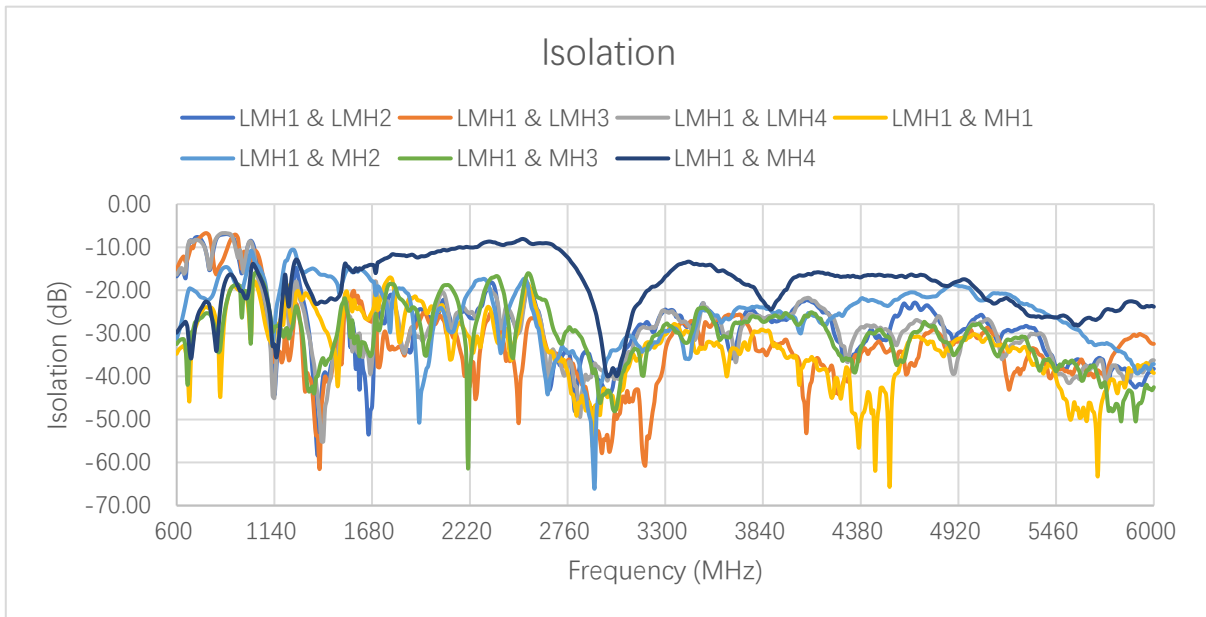


3.1.3.1.8. MH4

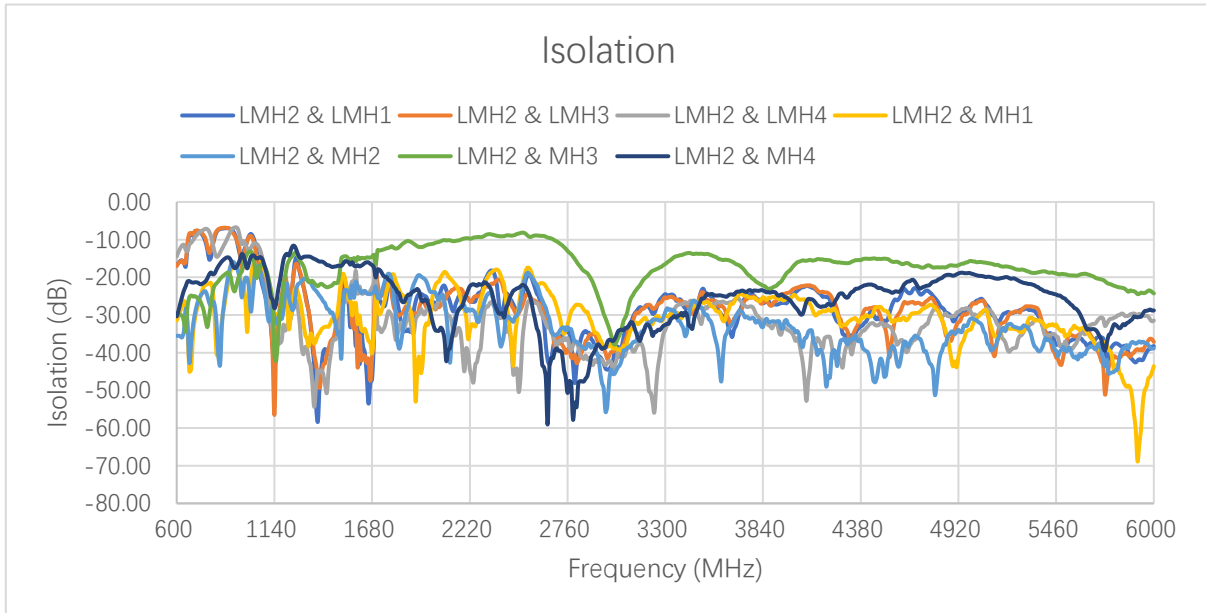


3.1.3.2. Test Status: On 500 × 500 mm Metal Plane

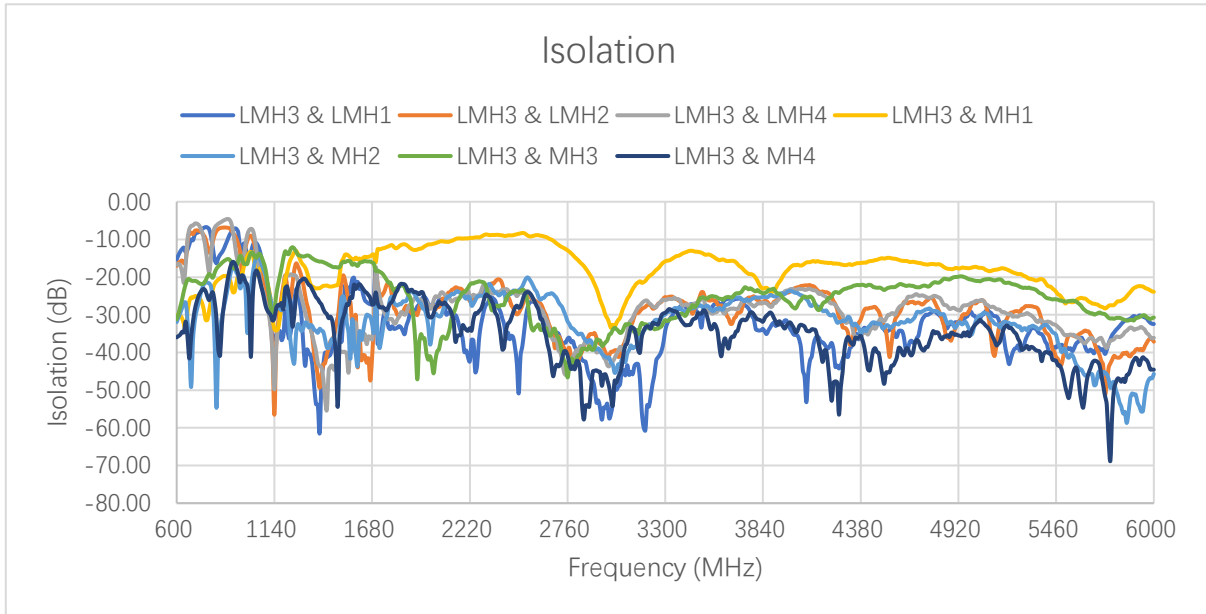
3.1.3.2.1. LMH1



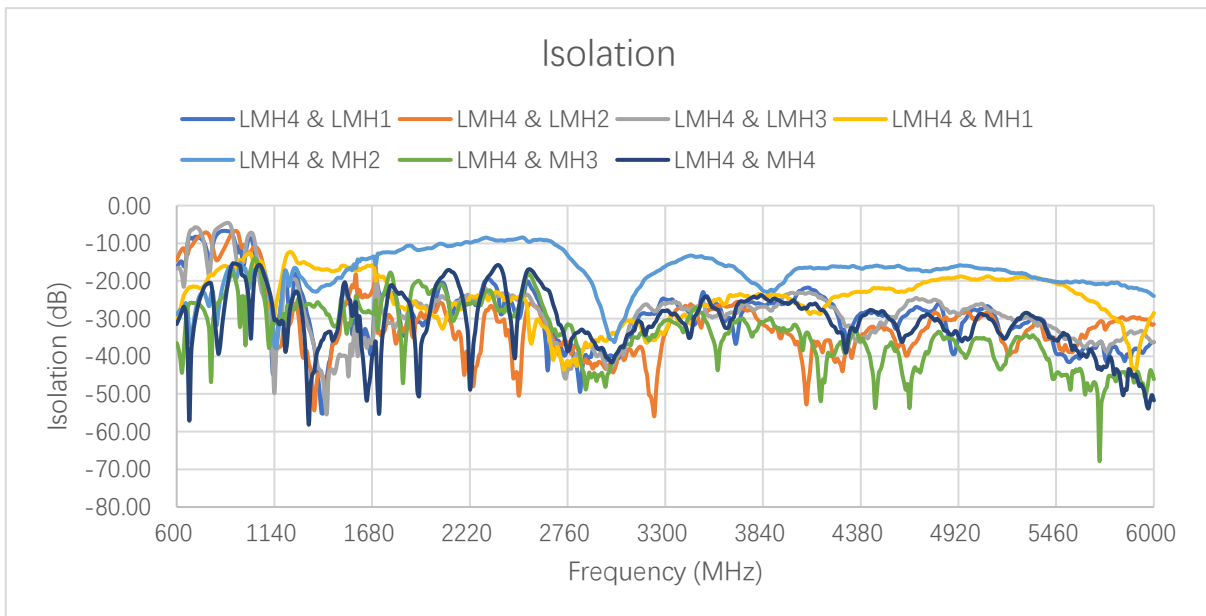
3.1.3.2.2. LMH2



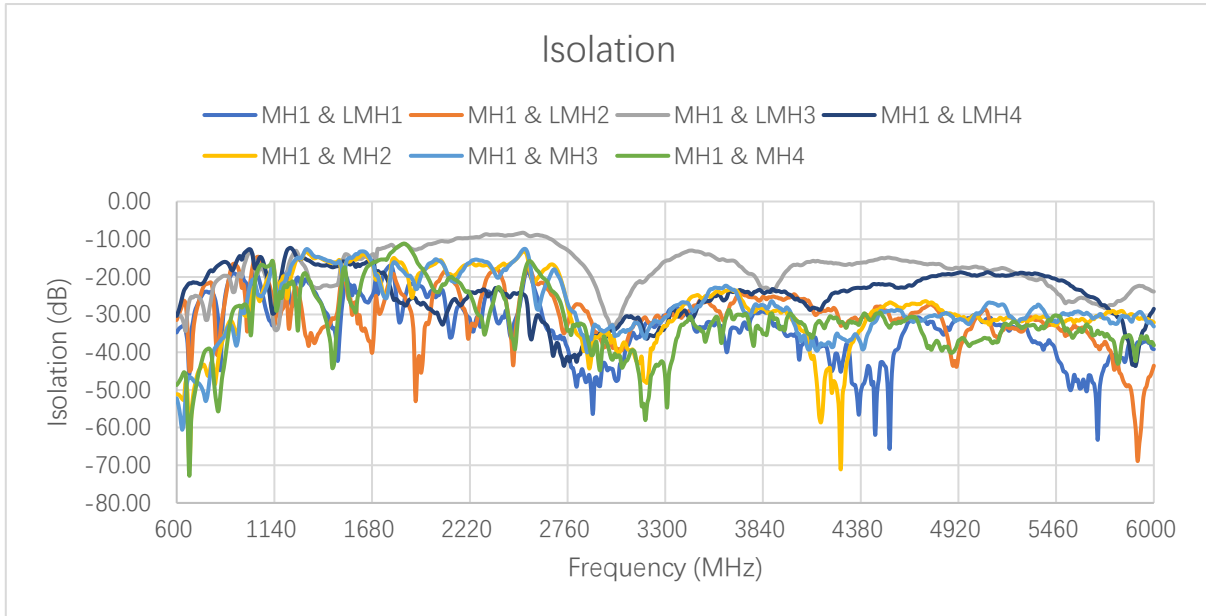
3.1.3.2.3. LMH3



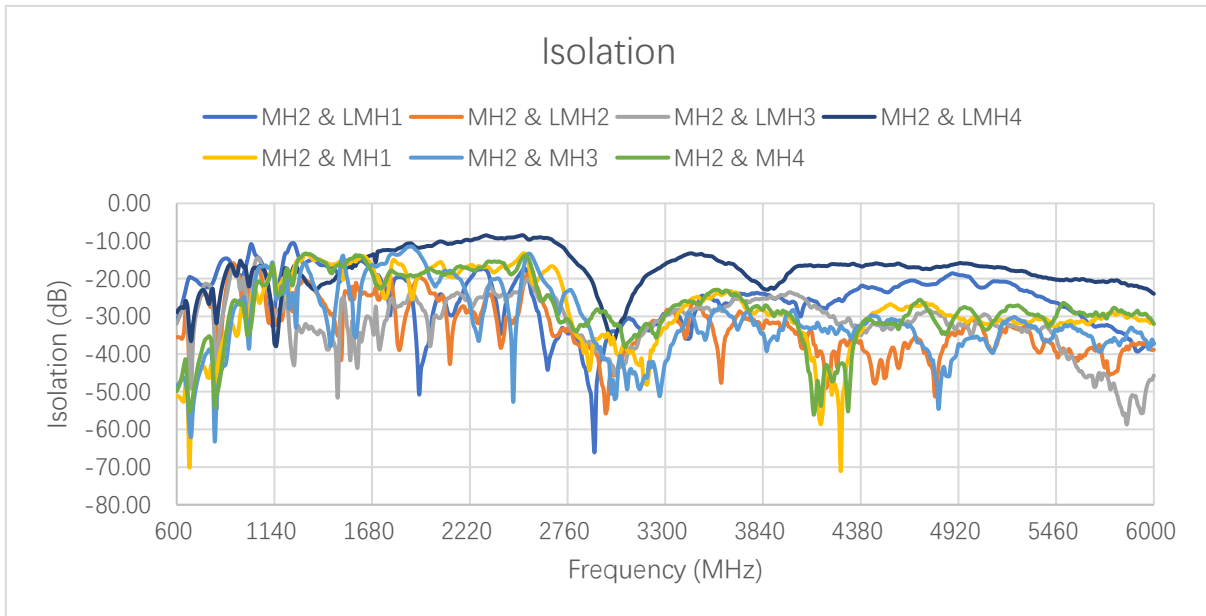
3.1.3.2.4. LMH4



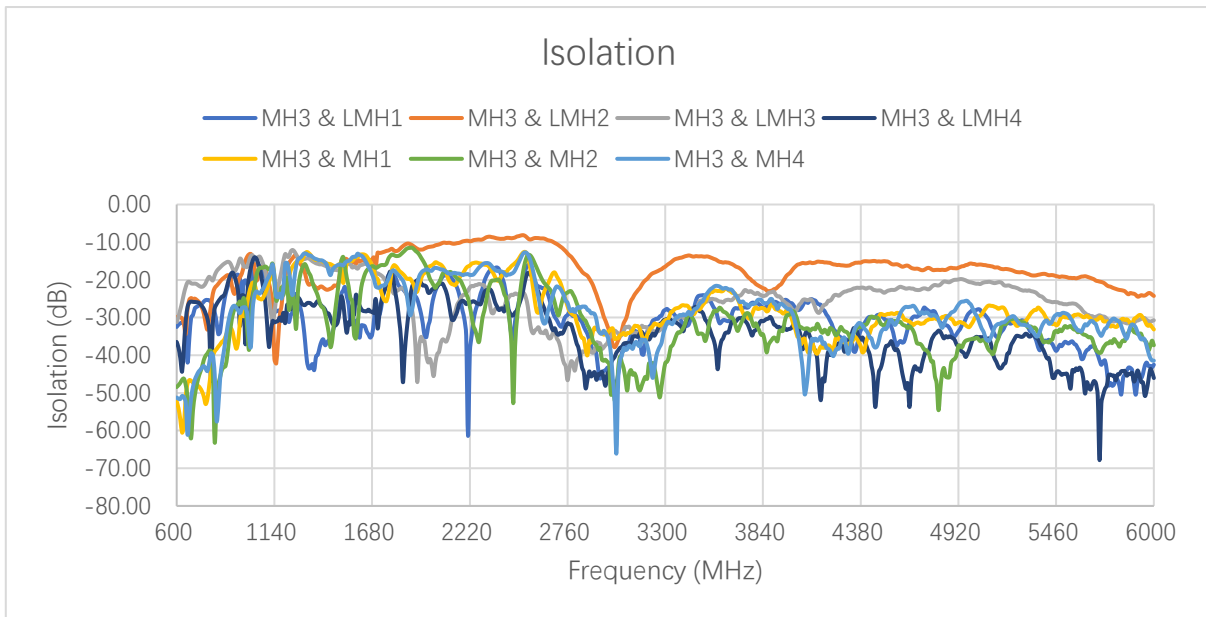
3.1.3.2.5. MH1



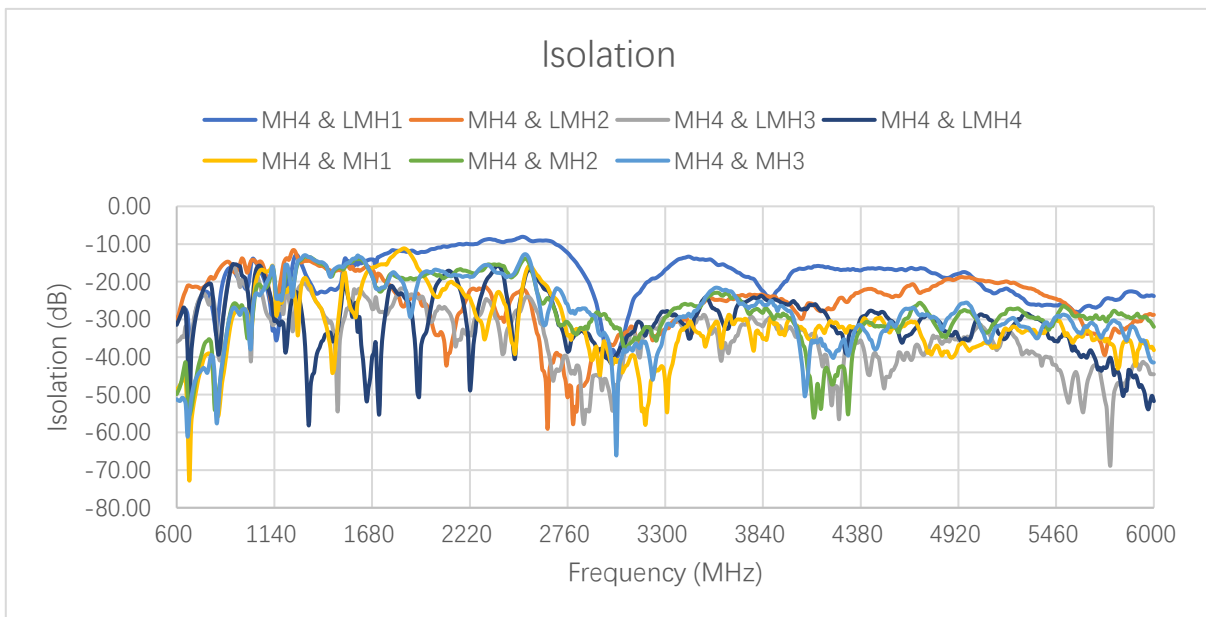
3.1.3.2.6. MH2



3.1.3.2.7. MH3



3.1.3.2.8. MH4



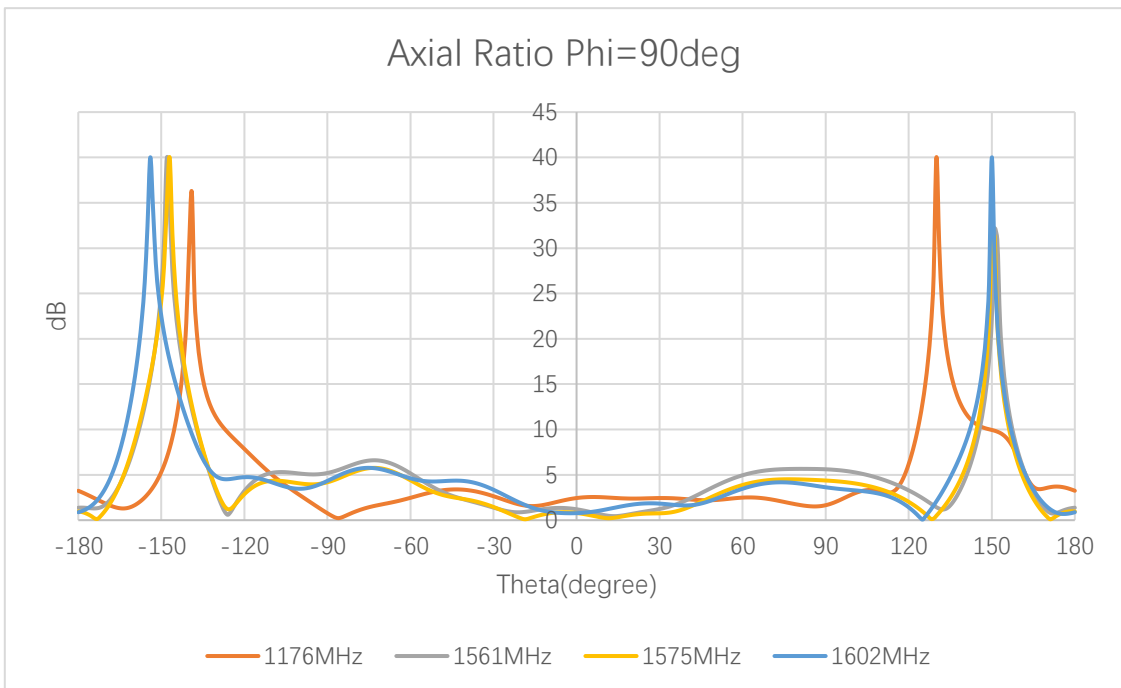
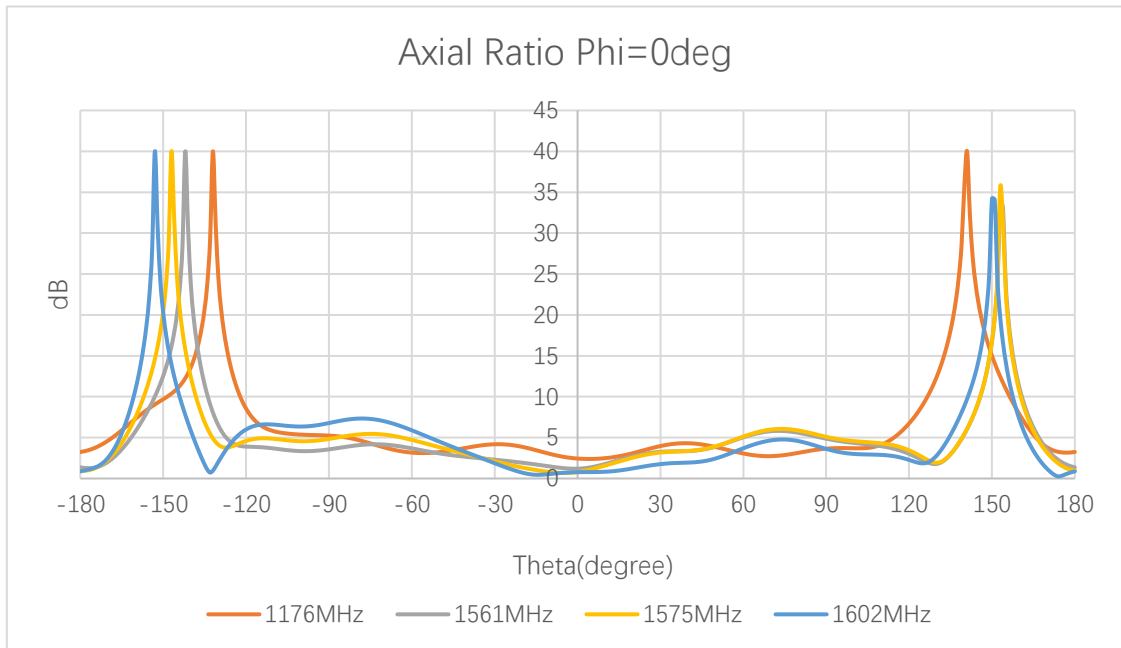
!

Max Isolation (dB)

	Band	B71	B12/ B13/ B28	B5/ B8/ B26	N74/ N75/ N76	B1/ B2/ B3	B40	Wi-Fi 2G	B38/ B41	B42/ B48/ N77	N79	Wi-Fi 5G
	Freq. (MHz)	600– 700	700– 810	820– 960	1420– 1520	1700– 2170	2300– 2400	2400– 2500	2500– 2690	3300– 4200	4400– 5000	5150– 5850
LMH1	FS	-7.9	-6.7	-6.7	-16.1	-10.0	-8.7	-8.2	-8.1	-13.3	-16.3	-20.7
	MP	-8.0	-8.0	-7.4	-15.4	-10.5	-9.8	-10.0	-9.5	-13.8	-14.3	-18.9
LMH2	FS	-7.7	-7.1	-6.7	-14.5	-10.0	-8.5	-8.2	-8.1	-13.5	-15.0	-17.0
	MP	-8.0	-8.0	-7.4	-15.0	-10.5	-9.5	-9.7	-8.7	-13.7	-13.5	-18.5
LMH3	FS	-5.8	-5.8	-4.6	-15.2	-9.7	-8.7	-8.4	-8.3	-13.0	-14.9	-17.6
	MP	-9.5	-9.1	-7.5	-14.4	-10.5	-9.3	-9.8	-9.8	-13.2	-13.6	-18.4
LMH4	FS	-5.8	-5.8	-4.6	-15.9	-10.1	-8.5	-8.6	-8.5	-13.3	-15.8	-17.0
	MP	-9.5	-9.6	-8.5	-14.8	-10.1	-9.4	-10.2	-9.4	-13.5	-14.2	-18.5
MH1	FS	-21.4	-18.3	-14.5	-15.2	-9.7	-8.7	-8.4	-8.3	-13.0	-14.9	-17.6
	MP	-25.4	-22.8	-20.5	-14.6	-10.5	-9.3	-9.8	-9.8	-13.2	-13.6	-18.4
MH2	FS	-19.6	-20.2	-14.6	-13.9	-10.1	-8.5	-8.6	-8.5	-13.3	-15.8	-17.0
	MP	-25.6	-22.4	-19.4	-14.8	-10.1	-9.4	-10.2	-9.4	-13.5	-14.2	-18.5
MH3	FS	-20.6	-19.2	-14.3	-13.9	-10.0	-8.5	-8.2	-8.1	-13.5	-15.0	-17.0
	MP	-25.0	-22.1	-19.9	-14.4	-10.5	-9.5	-9.7	-8.7	-13.7	-13.5	-18.5
MH4	FS	-21.0	-18.7	-13.8	-15.4	-10.0	-8.7	-8.2	-8.1	-13.3	-16.3	-19.9
	MP	-24.1	-21.9	-19.4	-15.0	-10.5	-9.8	-10.0	-9.5	-13.8	-14.3	-18.9

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

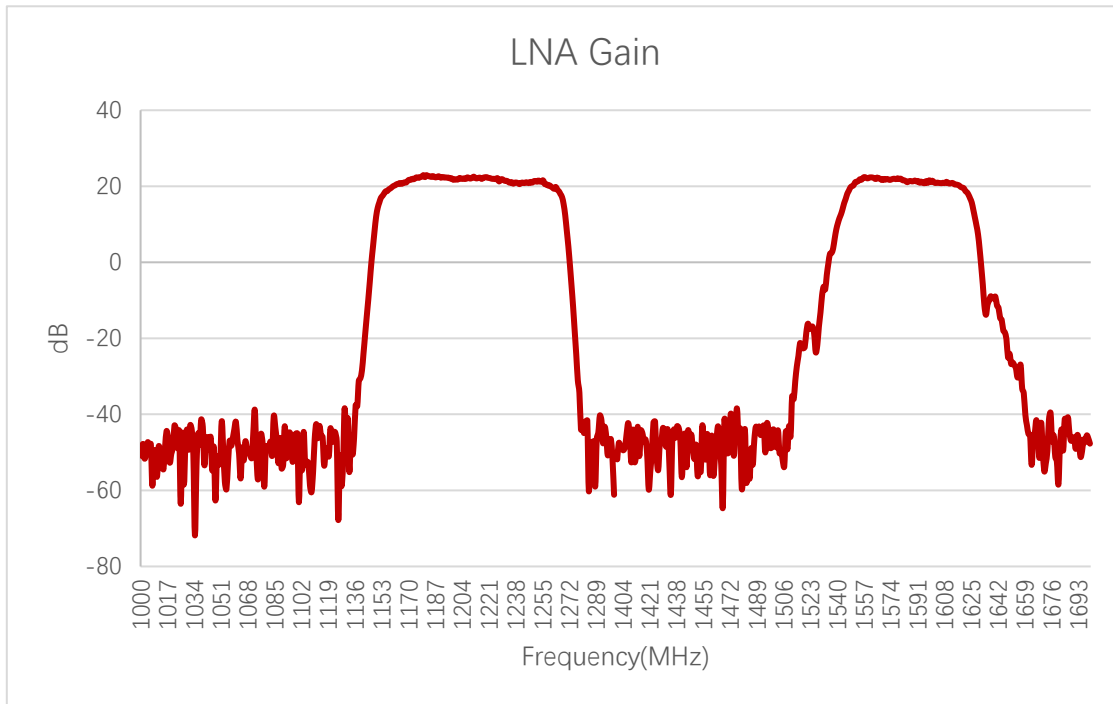
3.1.4. GNSS Axial Ratio



Axial Ratio (dB)

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

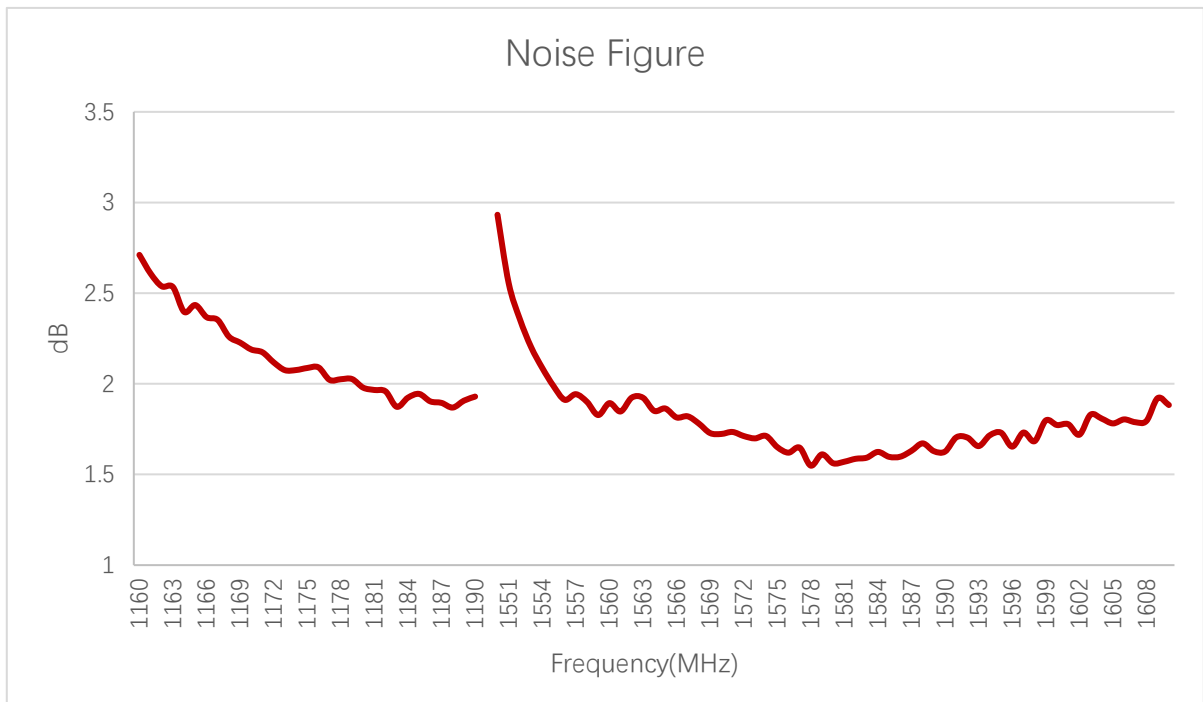
3.1.5. GNSS LNA Gain



LNA Gain(dB)

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

3.1.6. GNSS Noise Figure

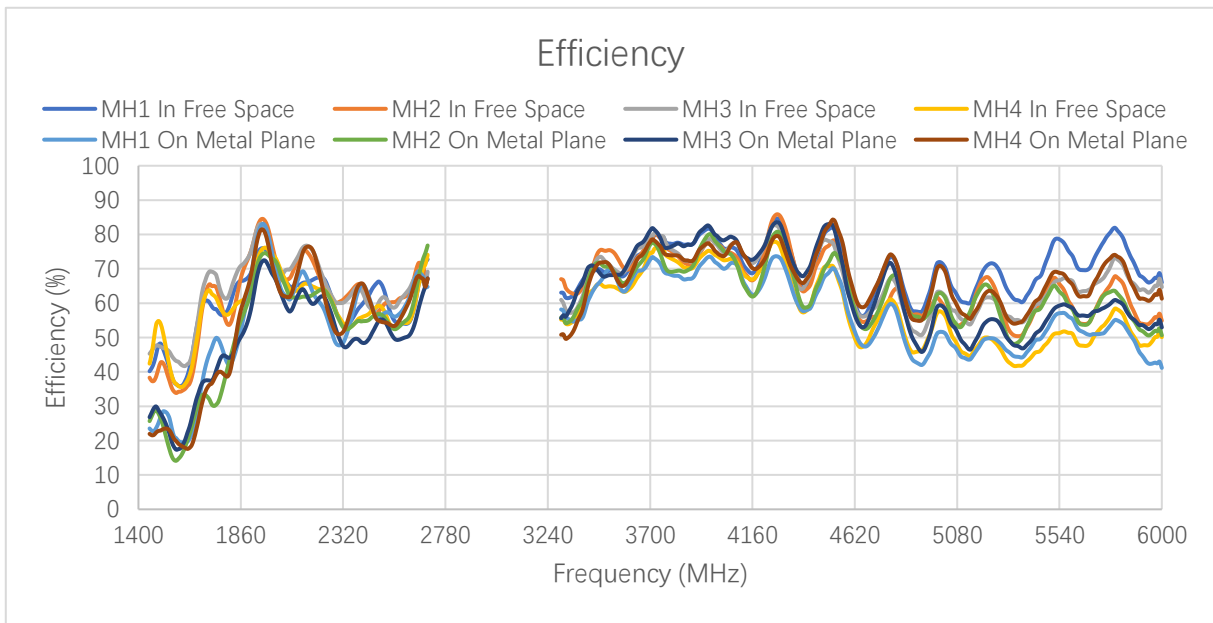
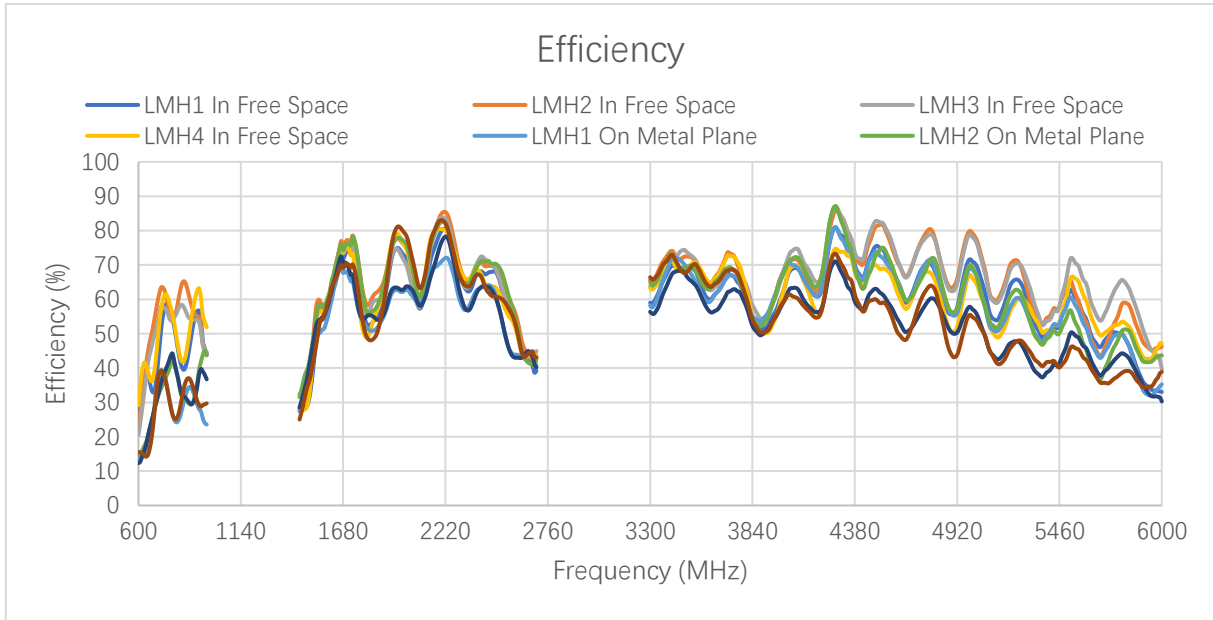


Noise Figure(dB)

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

3.2. Radiation Performance Test

3.2.1. Efficiency



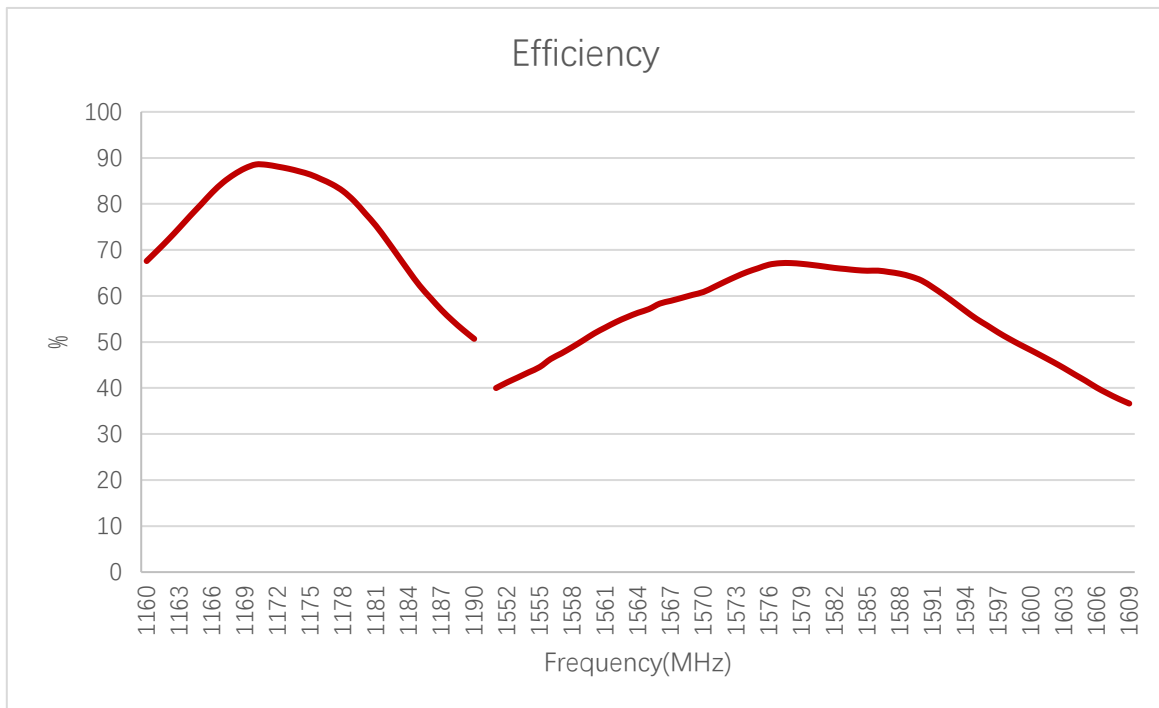
Efficiency (%)

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	26.9	40.4	45.5	40.2	55.1	43.8	28.1	74.0	72.9	56.7
	MP	13.4	14.3	37.5	28.0	31.2	23.6	27.5	66.8	62.7	53.5
LMH2	FS	22.5	36.9	61.6	64.6	55.6	44.6	32.4	77.1	76.9	63.5
	MP	15.0	17.3	32.9	31.6	32.5	43.7	31.5	76.1	77.2	61.1
LMH3	FS	20.6	32.8	55.9	58.4	54.1	44.4	32.4	74.9	74.2	60.0
	MP	12.3	15.7	33.7	31.8	31.7	36.7	28.5	69.0	64.0	54.5
LMH4	FS	29.2	41.6	52.9	41.9	60.5	51.9	27.3	74.6	69.6	60.1
	MP	15.4	14.7	38.6	31.6	32.3	29.7	25.0	70.0	68.7	54.7
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	74.1	71.1	62.5	67.9	52.0	60.4	64.3	71.0	59.8	33.0
	MP	62.5	68.8	58.6	64.1	43.9	59.2	63.5	68.7	58.4	35.3
LMH2	FS	77.2	75.8	65.5	69.8	53.9	63.9	72.7	79.3	63.6	46.3
	MP	76.8	75.1	65.2	70.8	51.7	63.0	62.8	69.4	55.1	43.6
LMH3	FS	74.4	74.5	64.0	71.1	50.5	63.7	72.6	78.1	67.1	39.8
	MP	63.4	66.2	57.2	63.5	43.0	57.4	53.5	57.1	47.1	30.3
LMH4	FS	78.5	77.3	66.3	64.0	49.5	65.6	62.9	66.2	61.3	47.1
	MP	79.3	76.2	63.9	61.8	50.3	64.4	55.2	54.9	43.2	38.9

Efficiency (%)

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	40.2	60.7	58.3	66.8
	MP	-	-	-	-	-	-	23.5	43.6	48.9	58.3
MH2	FS	-	-	-	-	-	-	38.3	64.6	65.0	71.0
	MP	-	-	-	-	-	-	25.7	32.8	30.1	58.2
MH3	FS	-	-	-	-	-	-	45.3	68.3	68.9	72.1
	MP	-	-	-	-	-	-	26.8	37.6	38.6	52.7

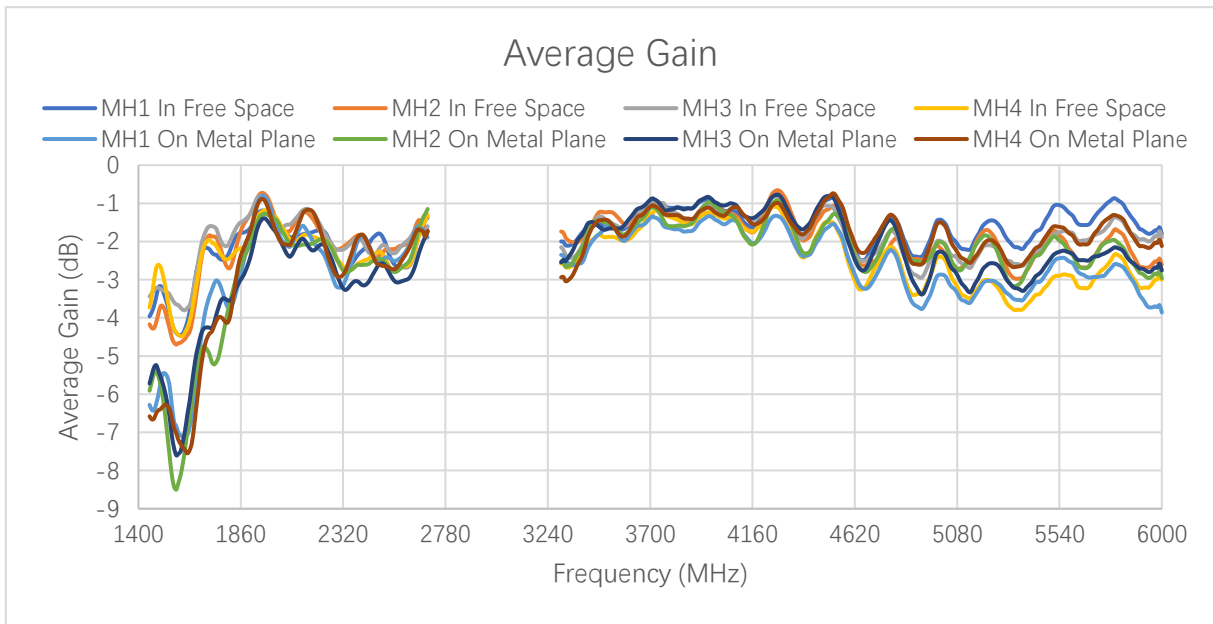
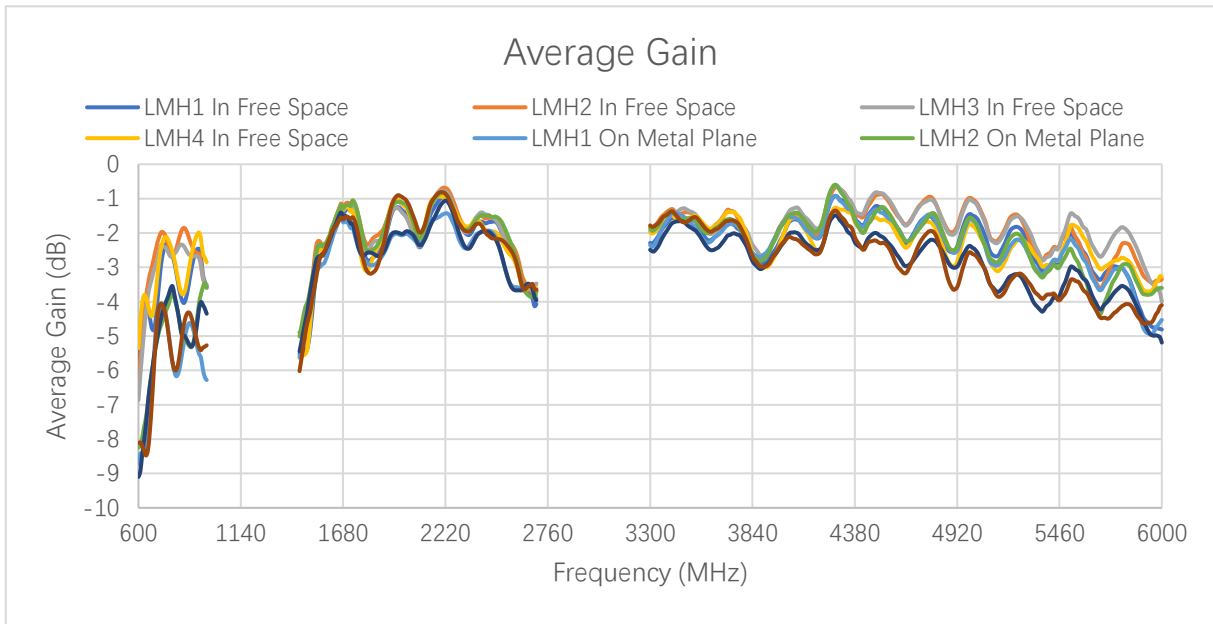
MH4	FS	-	-	-	-	-	-	42.4	63.4	62.2	61.4
	MP	-	-	-	-	-	-	22.0	35.4	37.9	62.1
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	75.9	65.9	54.5	64.1	54.0	69.4	61.7	72.0	75.7	66.0
	MP	82.5	69.3	53.8	59.1	59.3	64.5	49.6	51.6	54.3	41.2
MH2	FS	84.3	75.5	63.0	58.4	62.0	69.8	56.0	61.0	65.9	54.9
	MP	73.7	61.9	52.8	56.0	54.9	66.6	54.6	63.0	63.9	50.6
MH3	FS	83.1	76.3	61.9	58.1	62.7	70.9	58.2	63.4	64.4	64.7
	MP	71.5	64.1	48.2	51.3	50.1	71.6	58.4	59.4	56.9	52.9
MH4	FS	75.1	65.4	53.1	57.9	54.2	63.8	52.3	57.6	49.8	50.1
	MP	81.3	74.9	56.9	58.8	58.3	66.6	62.9	70.9	67.8	61.3



Efficiency (%) -GNSS

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

3.2.2. Average Gain



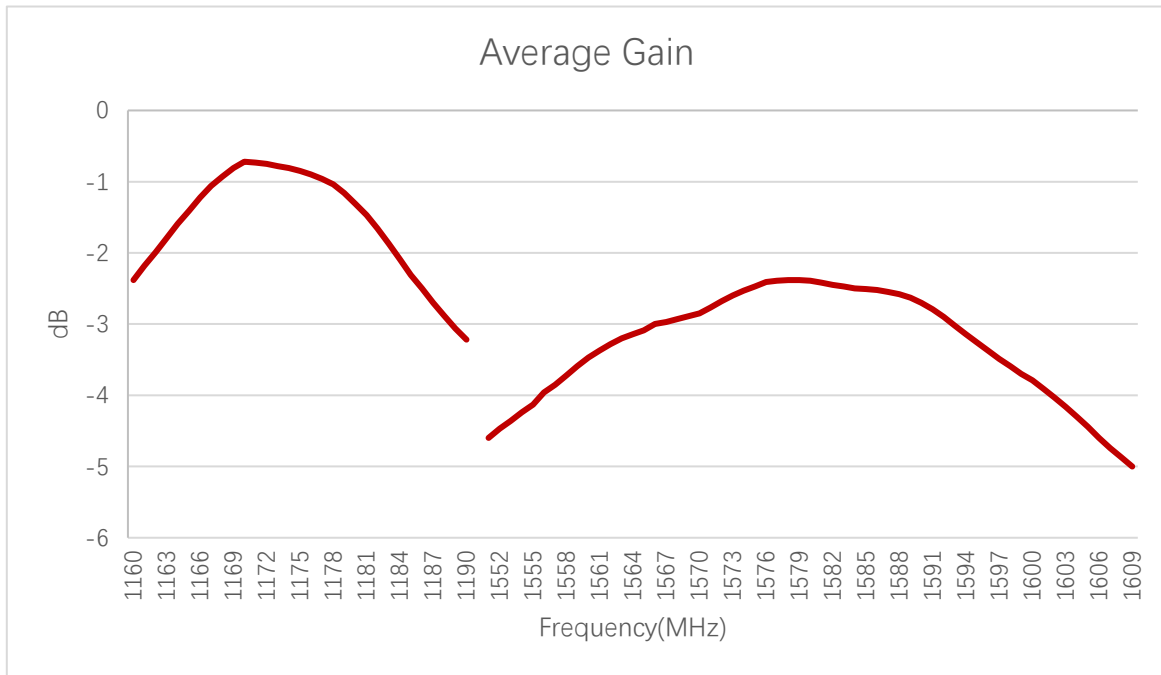
Average Gain (dB)

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	-5.7	-3.9	-3.4	-4.0	-2.6	-3.6	-5.5	-1.3	-1.4	-2.5
	MP	-8.7	-8.4	-4.3	-5.5	-5.1	-6.3	-5.6	-1.8	-2.0	-2.7
LMH2	FS	-6.5	-4.3	-2.1	-1.9	-2.5	-3.5	-4.9	-1.1	-1.1	-2.0
	MP	-8.2	-7.6	-4.8	-5.0	-4.9	-3.6	-5.0	-1.2	-1.1	-2.1
LMH3	FS	-6.9	-4.8	-2.5	-2.3	-2.7	-3.5	-4.9	-1.3	-1.3	-2.2
	MP	-9.1	-8.0	-4.7	-5.0	-5.0	-4.4	-5.5	-1.6	-1.9	-2.6
LMH4	FS	-5.3	-3.8	-2.8	-3.8	-2.2	-2.8	-5.6	-1.3	-1.6	-2.2
	MP	-8.1	-8.3	-4.1	-5.0	-4.9	-5.3	-6.0	-1.5	-1.6	-2.6
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	-1.3	-1.5	-2.0	-1.7	-2.8	-2.2	-1.9	-1.5	-2.2	-4.8
	MP	-2.0	-1.6	-2.3	-1.9	-3.6	-2.3	-2.0	-1.6	-2.3	-4.5
LMH2	FS	-1.1	-1.2	-1.8	-1.6	-2.7	-1.9	-1.4	-1.0	-2.0	-3.3
	MP	-1.1	-1.2	-1.9	-1.5	-2.9	-2.0	-2.0	-1.6	-2.6	-3.6
LMH3	FS	-1.3	-1.3	-1.9	-1.5	-3.0	-2.0	-1.4	-1.1	-1.7	-4.0
	MP	-2.0	-1.8	-2.4	-2.0	-3.7	-2.4	-2.7	-2.4	-3.3	-5.2
LMH4	FS	-1.1	-1.1	-1.8	-1.9	-3.1	-1.8	-2.0	-1.8	-2.1	-3.3
	MP	-1.0	-1.2	-1.9	-2.1	-3.0	-1.9	-2.6	-2.6	-3.6	-4.1

Average Gain (dB)

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	-4.0	-2.2	-2.3	-1.8
	MP	-	-	-	-	-	-	-6.3	-3.6	-3.1	-2.3
MH2	FS	-	-	-	-	-	-	-4.2	-1.9	-1.9	-1.5
	MP	-	-	-	-	-	-	-5.9	-4.8	-5.2	-2.4
MH3	FS	-	-	-	-	-	-	-3.4	-1.7	-1.6	-1.4
	MP	-	-	-	-	-	-	-5.7	-4.2	-4.1	-2.8

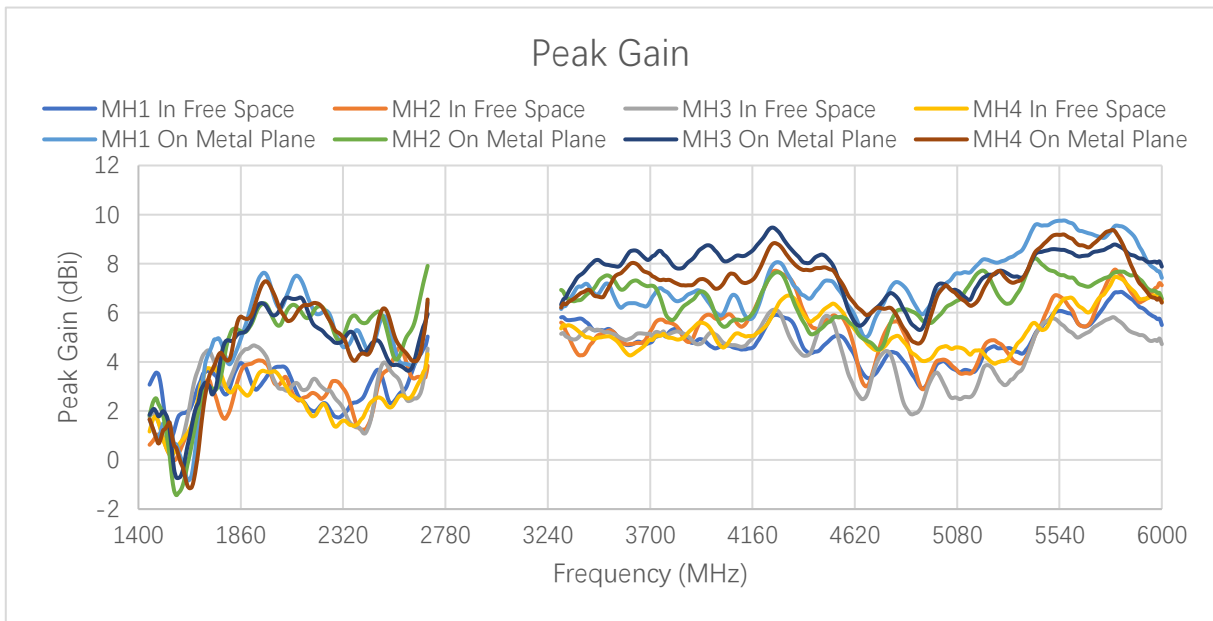
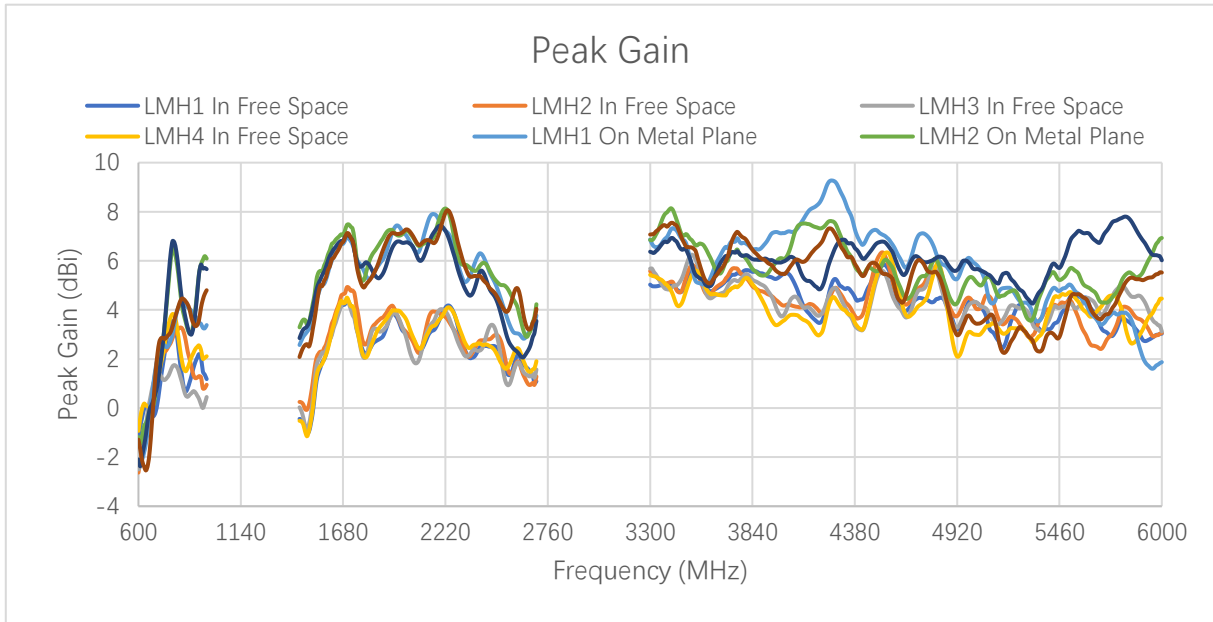
MH4	FS	-	-	-	-	-	-	-3.7	-2.0	-2.1	-2.1
	MP	-	-	-	-	-	-	-6.6	-4.5	-4.2	-2.1
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	-1.2	-1.8	-2.6	-1.9	-2.7	-1.6	-2.1	-1.4	-1.2	-1.8
	MP	-0.8	-1.6	-2.7	-2.3	-2.3	-1.9	-3.0	-2.9	-2.7	-3.9
MH2	FS	-0.7	-1.2	-2.0	-2.3	-2.1	-1.6	-2.5	-2.1	-1.8	-2.6
	MP	-1.3	-2.1	-2.8	-2.5	-2.6	-1.8	-2.6	-2.0	-1.9	-3.0
MH3	FS	-0.8	-1.2	-2.1	-2.4	-2.0	-1.5	-2.4	-2.0	-1.9	-1.9
	MP	-1.5	-1.9	-3.2	-2.9	-3.0	-1.5	-2.3	-2.3	-2.4	-2.8
MH4	FS	-1.2	-1.8	-2.7	-2.4	-2.7	-2.0	-2.8	-2.4	-3.0	-3.0
	MP	-0.9	-1.3	-2.4	-2.3	-2.3	-1.8	-2.0	-1.5	-1.7	-2.1



Average Gain(dB)-GNSS

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

3.2.3. Peak Gain



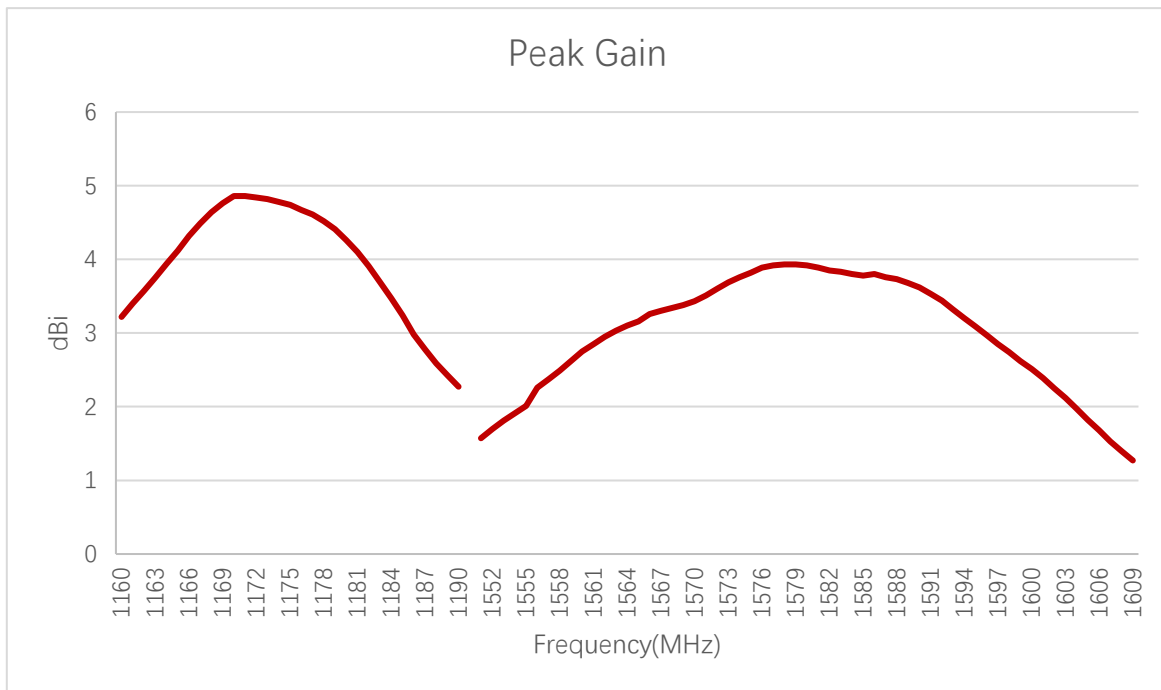
Peak Gain (dBi)

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LMH1	FS	-1.2	0.0	0.7	1.3	1.9	1.2	-0.4	4.3	3.8	2.9
	MP	-2.1	-1.8	2.3	4.3	3.8	3.4	2.6	6.9	6.4	6.0
LMH2	FS	-2.6	-1.4	2.3	3.3	1.2	1.0	0.3	4.9	4.7	3.7
	MP	-1.2	-0.7	1.7	4.2	4.0	6.1	3.3	7.5	6.9	6.8
LMH3	FS	-2.5	-1.4	1.4	1.0	0.6	0.5	0.0	4.3	3.6	3.1
	MP	-2.1	-1.5	1.5	4.4	3.9	5.7	2.9	7.0	6.4	5.4
LMH4	FS	-0.9	0.2	1.5	1.9	2.4	2.1	-0.5	4.4	3.9	3.4
	MP	-1.3	-2.4	2.7	4.5	3.3	4.8	2.1	7.1	6.5	6.2
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
LMH1	FS	3.8	3.1	2.0	2.5	2.2	4.9	4.4	4.4	4.3	3.0
	MP	7.3	7.8	5.4	5.6	3.0	5.1	6.8	6.0	5.0	1.9
LMH2	FS	4.1	3.8	2.1	2.8	1.9	4.6	4.8	4.3	4.3	3.1
	MP	7.2	6.8	5.7	5.7	4.1	6.4	5.0	5.3	5.5	6.9
LMH3	FS	3.9	3.4	2.2	3.3	1.9	4.6	4.5	4.3	4.2	3.1
	MP	6.7	6.9	4.6	4.9	2.3	5.0	6.2	5.7	6.4	6.0
LMH4	FS	4.0	3.2	2.5	2.5	2.4	4.8	4.0	3.0	4.6	4.5
	MP	7.1	6.8	5.4	4.9	4.9	5.1	5.9	3.6	4.0	5.5

Peak Gain (dBi)

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
MH1	FS	-	-	-	-	-	-	3.1	3.6	3.5	3.8
	MP	-	-	-	-	-	-	1.7	4.2	4.9	5.5
MH2	FS	-	-	-	-	-	-	0.6	3.3	2.7	3.9
	MP	-	-	-	-	-	-	1.8	3.0	2.9	5.2
MH3	FS	-	-	-	-	-	-	1.8	4.5	4.0	4.5
	MP	-	-	-	-	-	-	1.8	3.1	2.8	5.2

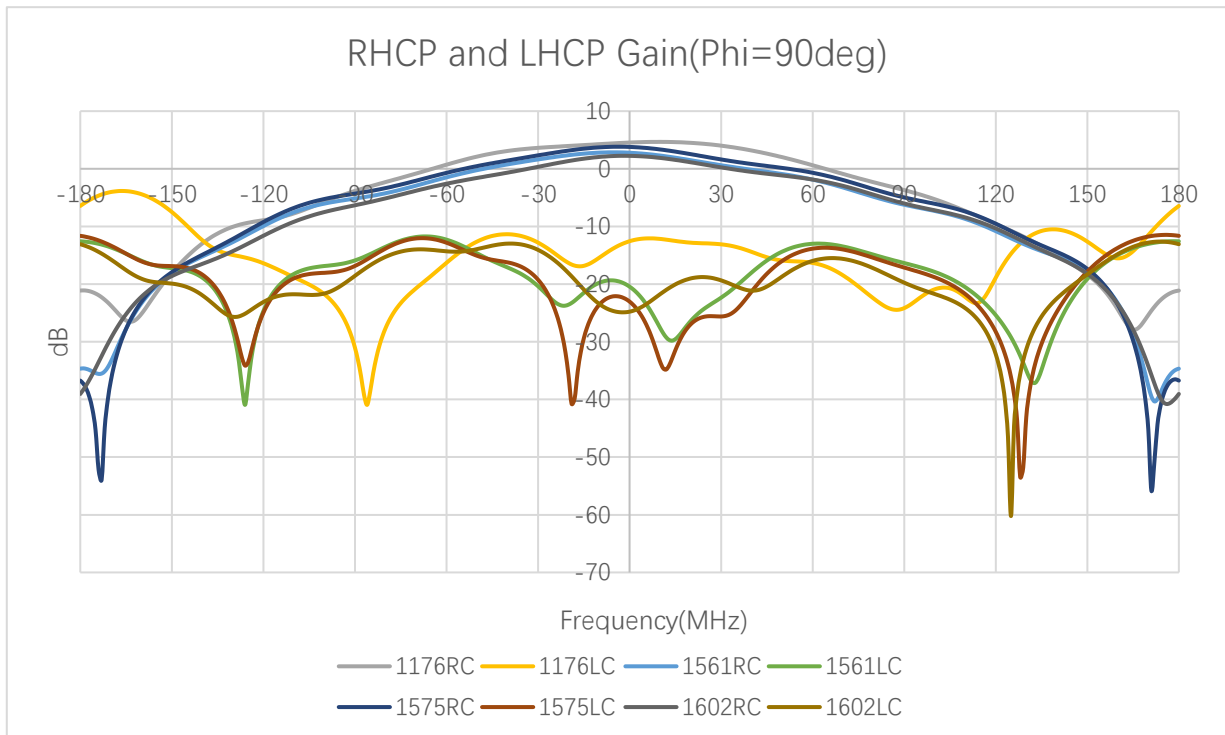
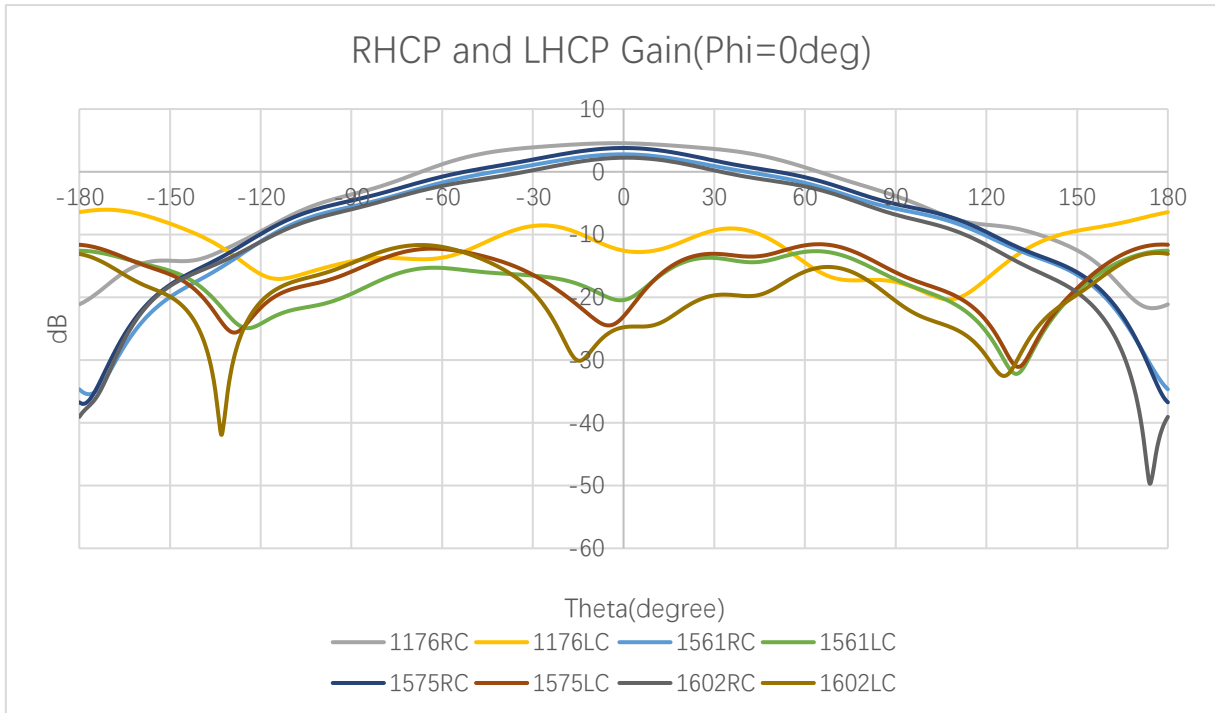
MH4	FS	-	-	-	-	-	-	1.2	3.7	3.8	2.7
	MP	-	-	-	-	-	-	1.7	3.1	3.8	5.8
Frequency (MHz)		1950	2140	2350	2450	2600	3600	4700	5000	5500	6000
MH1	FS	3.1	2.4	2.2	3.3	2.9	4.7	3.4	4.0	5.8	5.5
	MP	7.5	7.2	4.8	4.6	3.9	6.4	5.5	6.9	9.6	7.4
MH2	FS	4.1	2.5	2.4	1.9	4.1	4.7	3.6	4.1	6.4	7.1
	MP	6.3	5.9	5.7	5.9	4.9	7.1	4.7	5.9	7.7	6.6
MH3	FS	4.5	2.9	1.5	1.9	2.5	4.9	3.5	3.5	5.8	4.7
	MP	6.4	6.5	5.2	4.8	3.7	8.4	6.1	7.2	8.6	7.9
MH4	FS	3.6	2.4	1.4	2.4	2.6	4.3	4.6	4.6	5.7	6.5
	MP	7.0	6.3	4.3	4.6	4.4	7.9	6.1	6.8	9.1	6.4



Peak Gain(dBi)-GNSS

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

3.2.4. GNSS 2D RHCP and LHCP Gain

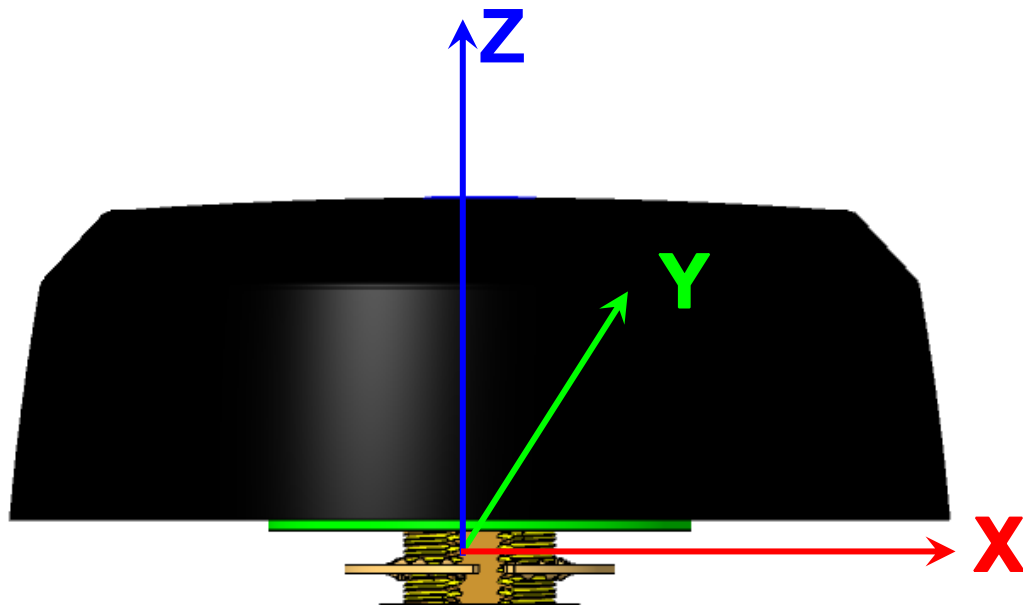


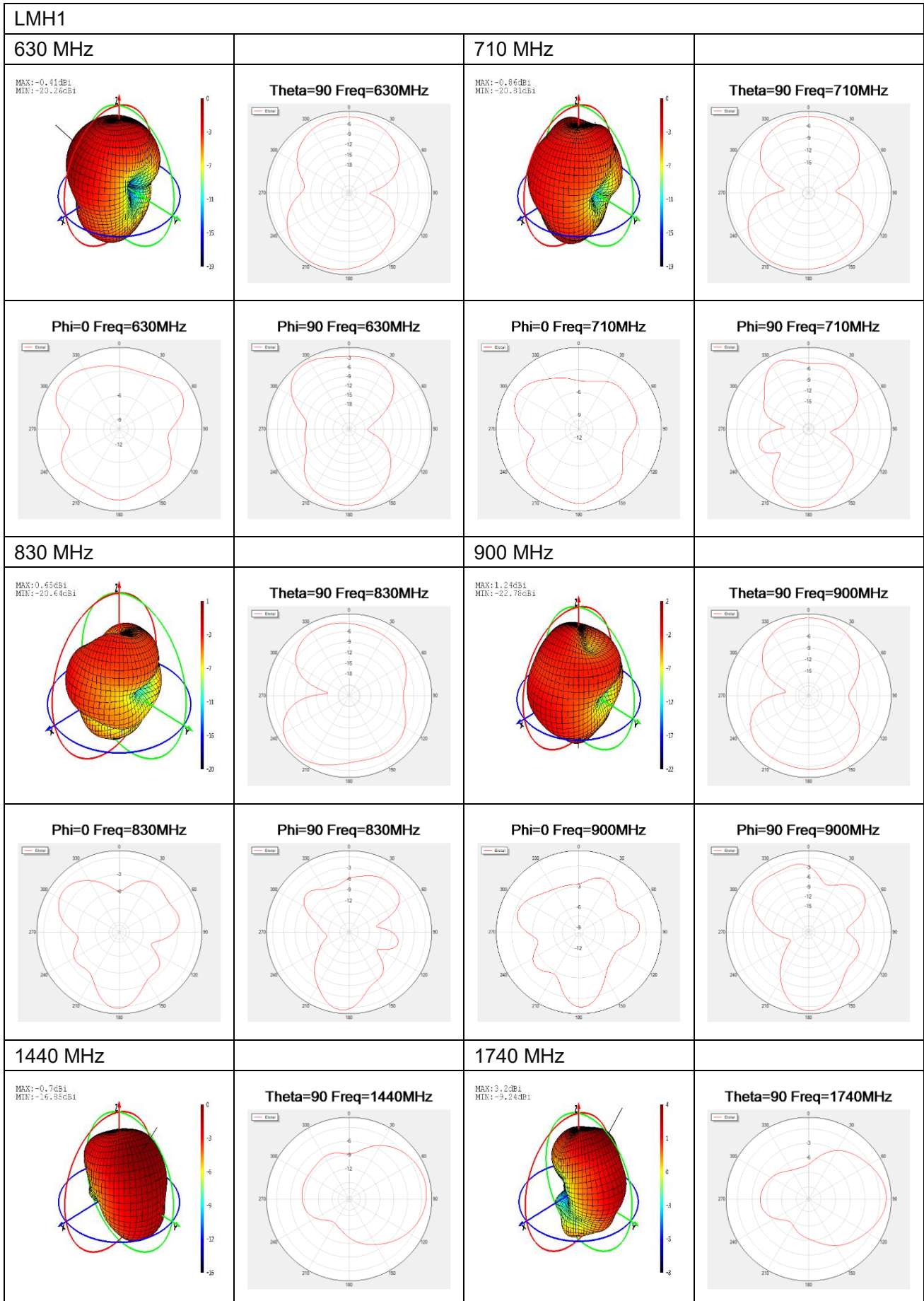
2D RHCP and LHCP Gain (dB)

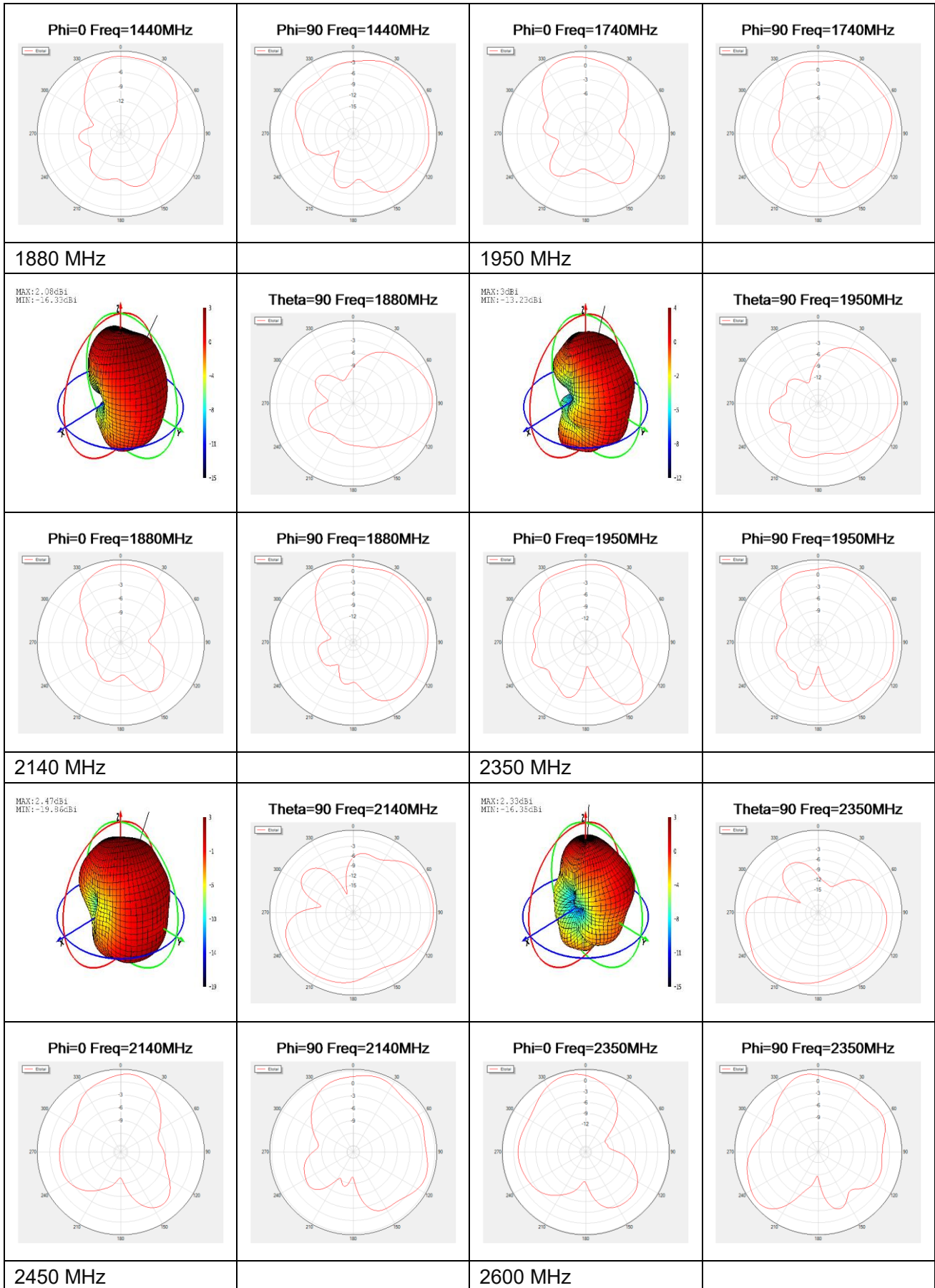
Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
RC Gain(dB)	Phi = 0 (deg) Theta = 0 (deg)	4.55	-	-	-	-	2.78	3.79	2.24
	Phi = 90 (deg) Theta = 0 (deg)	4.55	-	-	-	-	2.78	3.79	2.24
LC Gain(dB)	Phi = 0 (deg) Theta = 0 (deg)	-12.56	-	-	-	-	-20.4	-23	-24.7
	Phi = 90 (deg) Theta = 0 (deg)	-12.56	-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

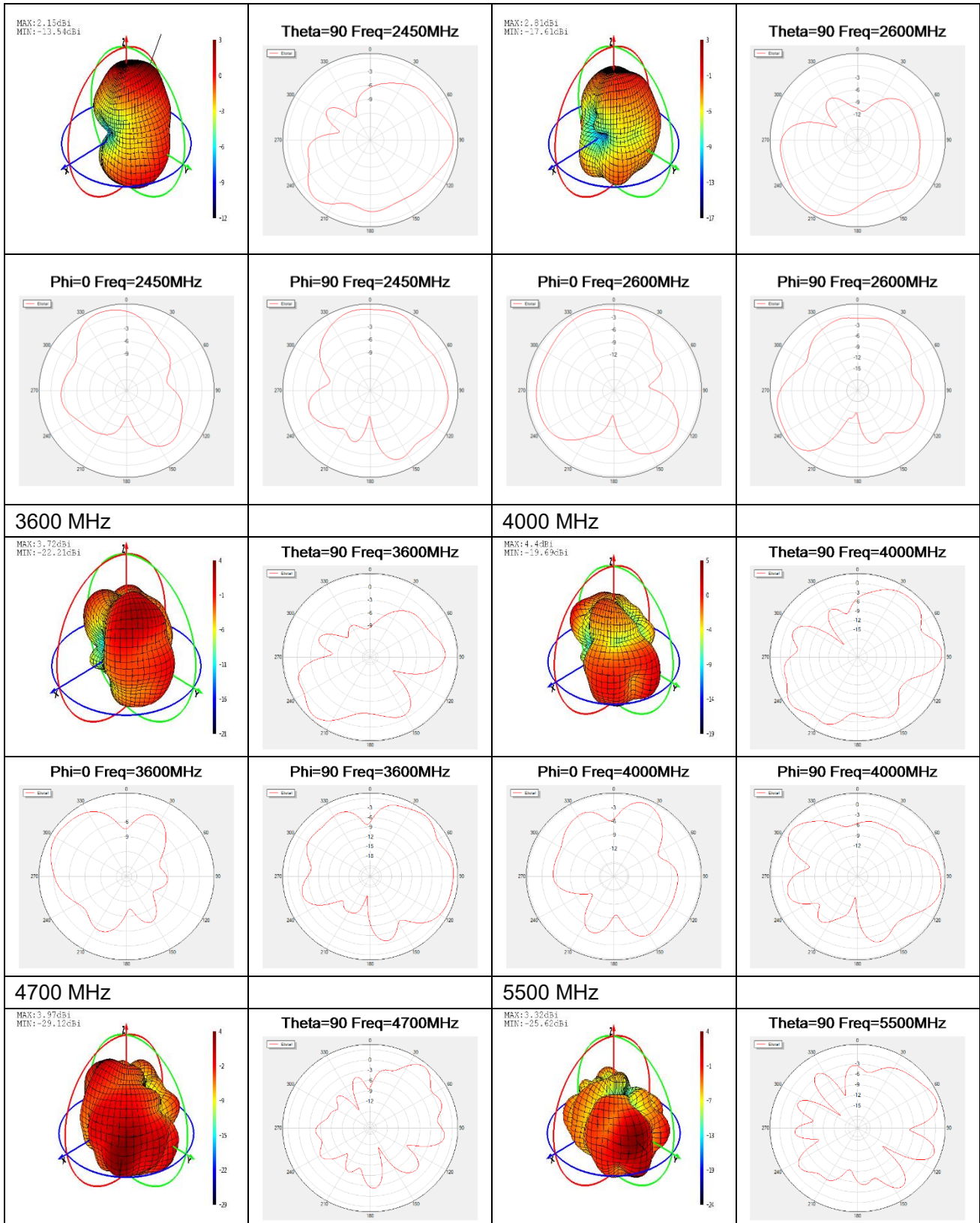
3.2.5. 3D & 2D Radiation Pattern

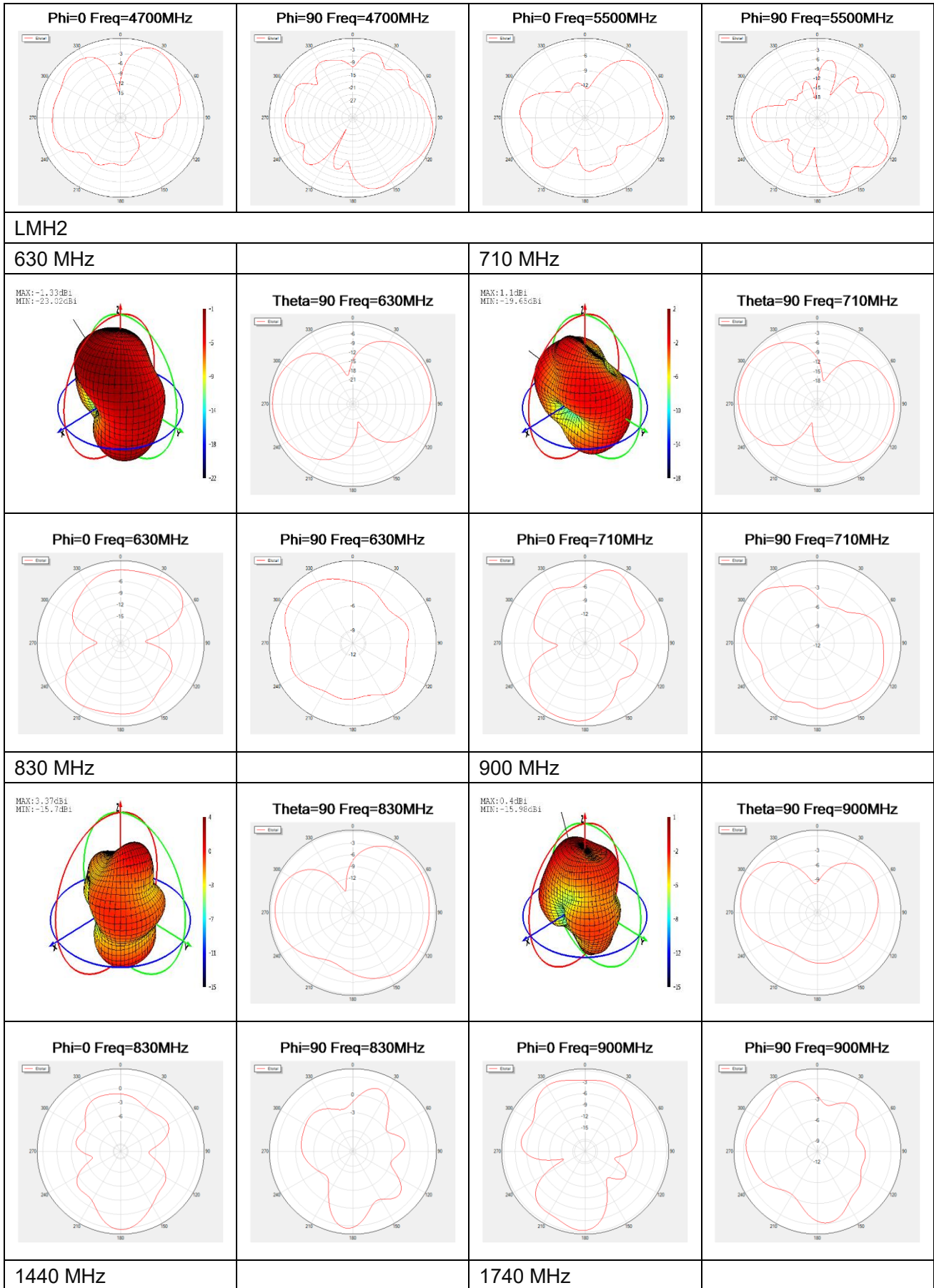
3.2.5.1. Test Status: In Free Space

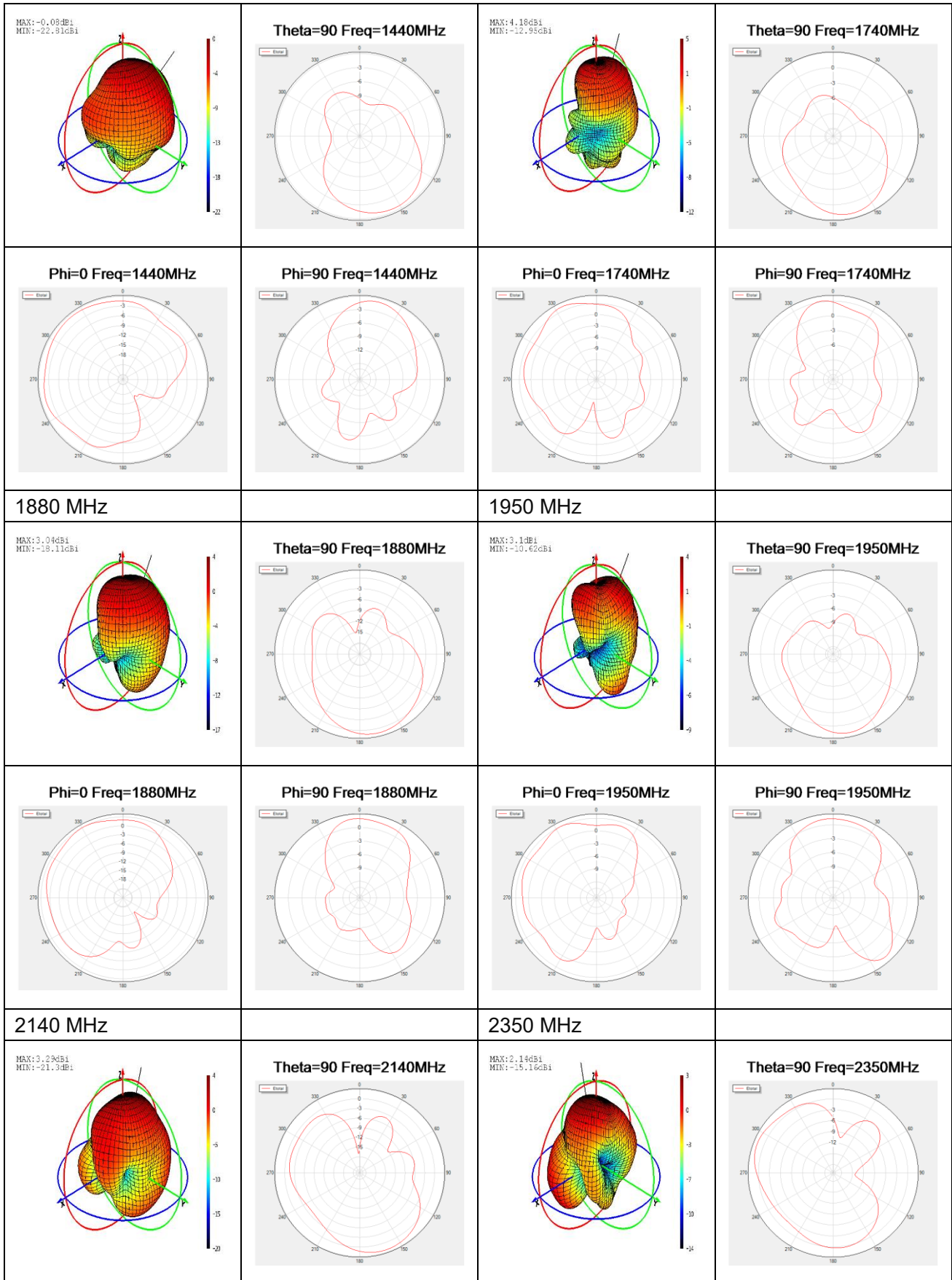


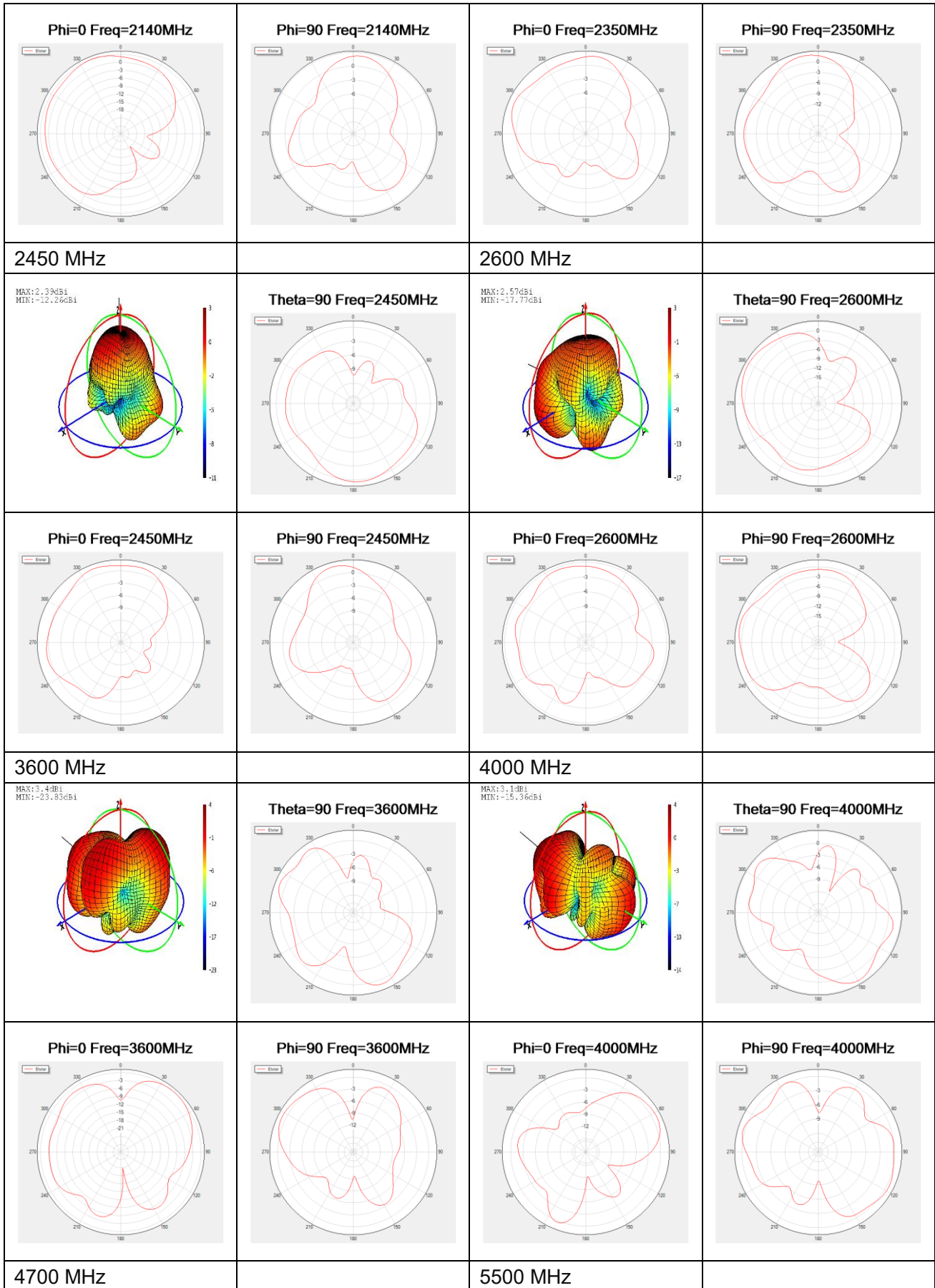


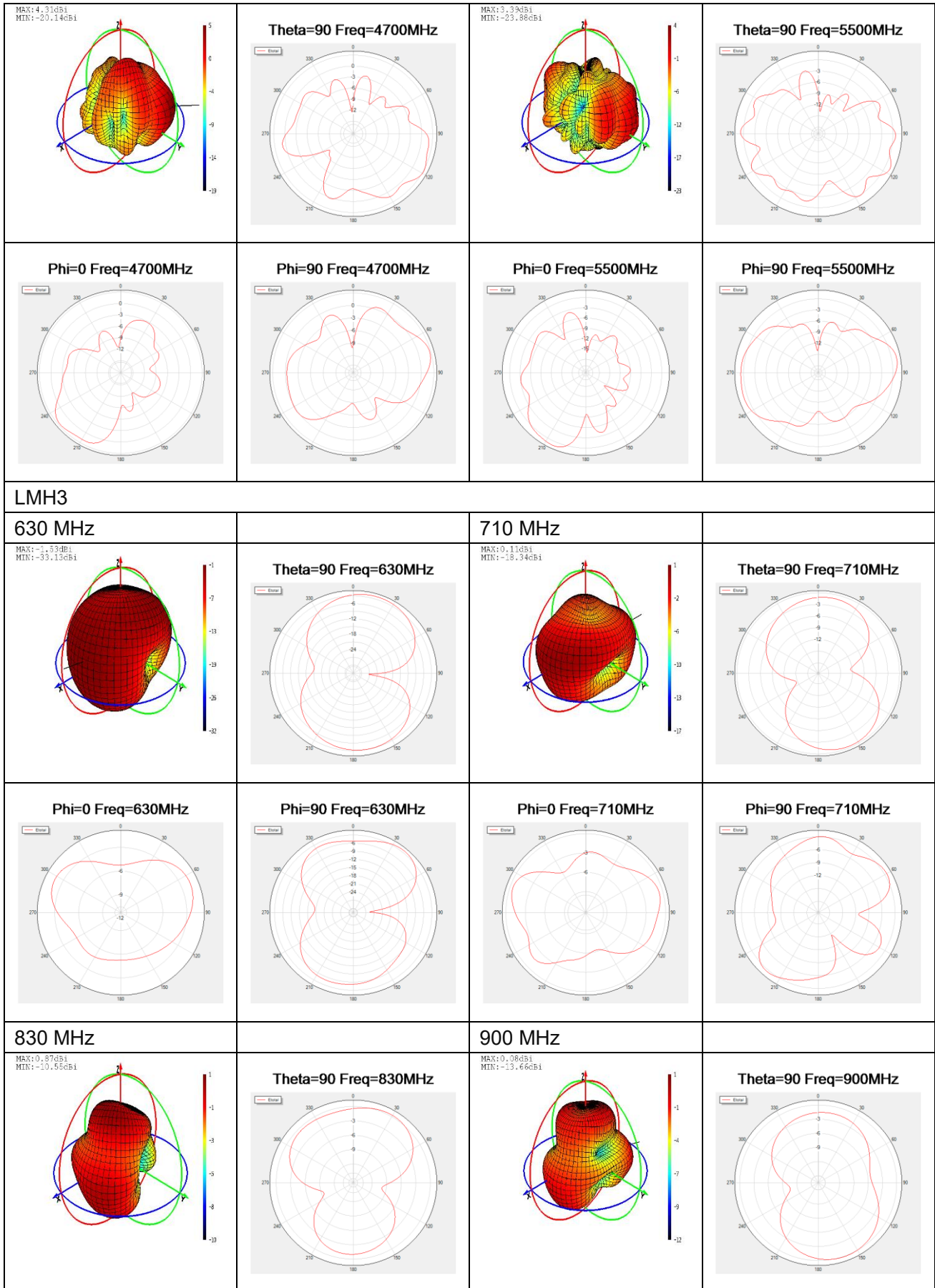


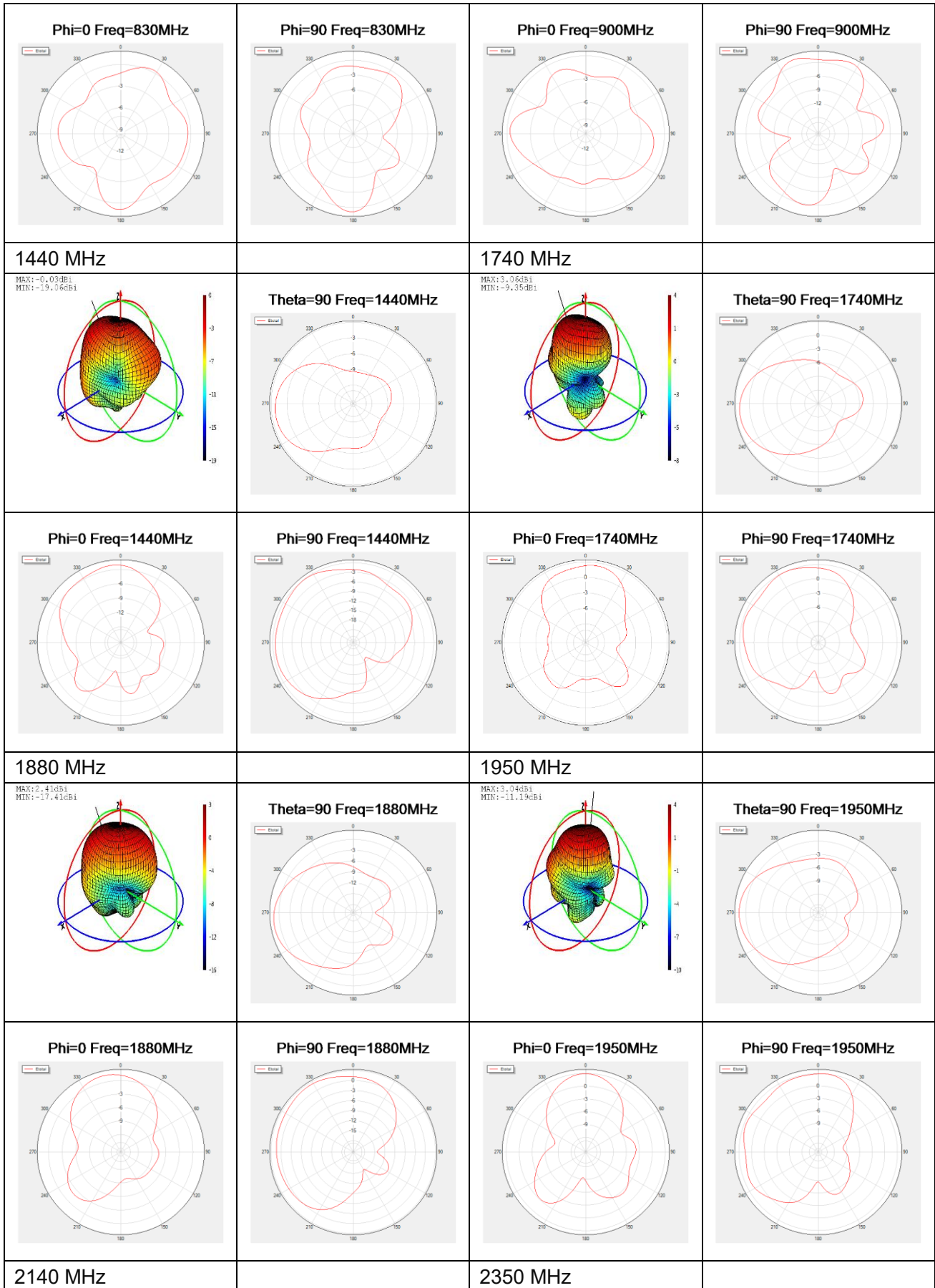


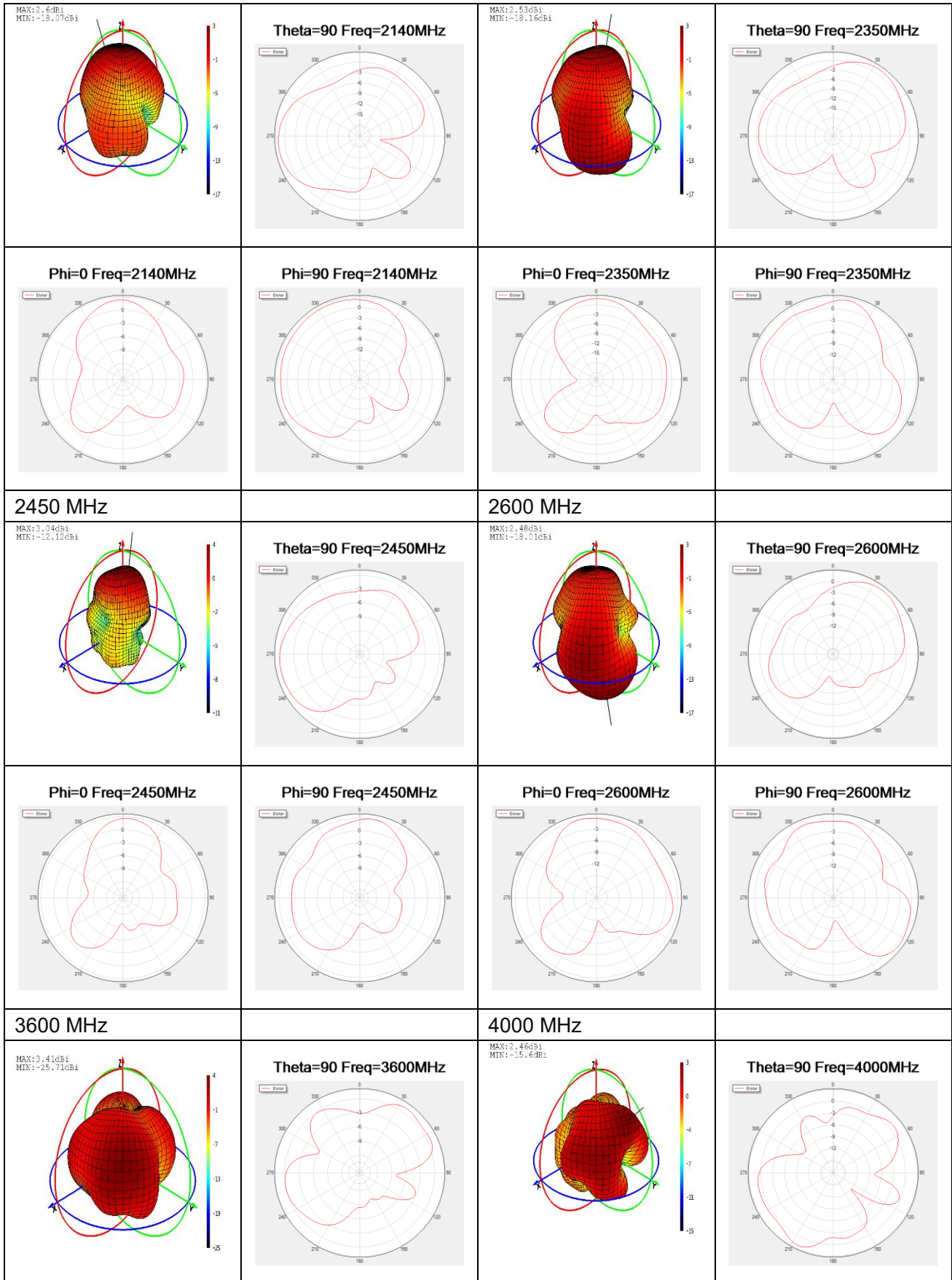


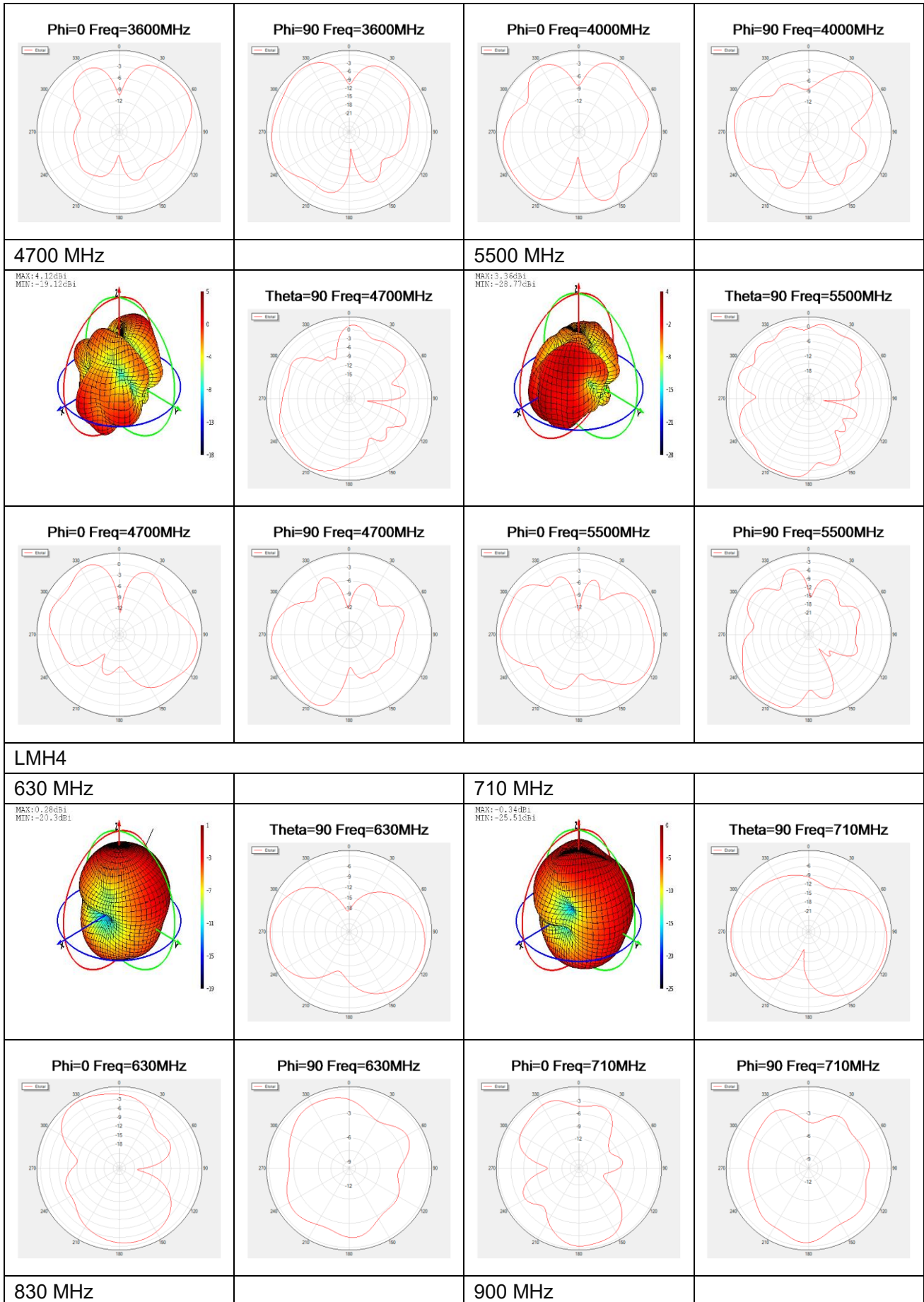


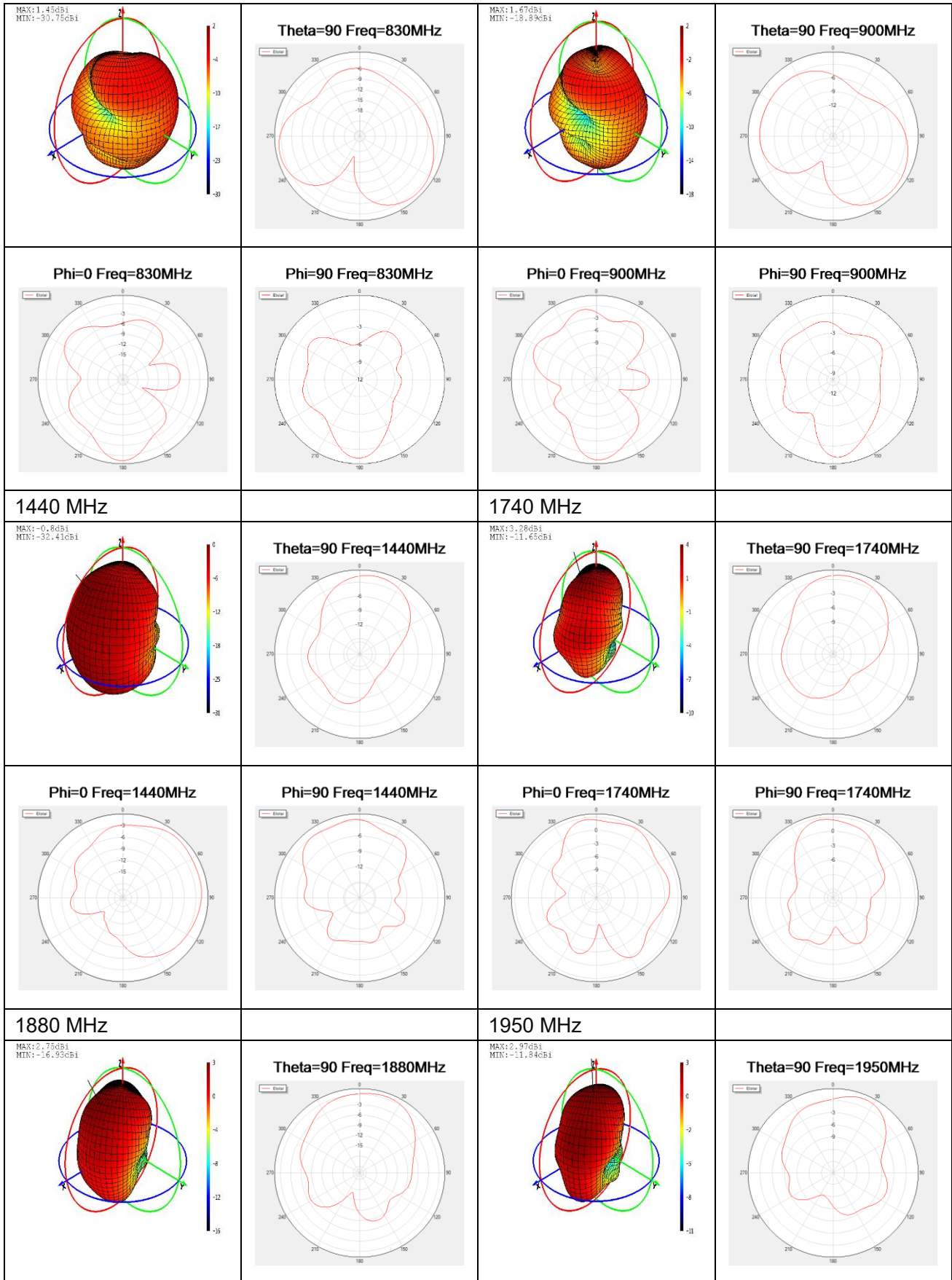


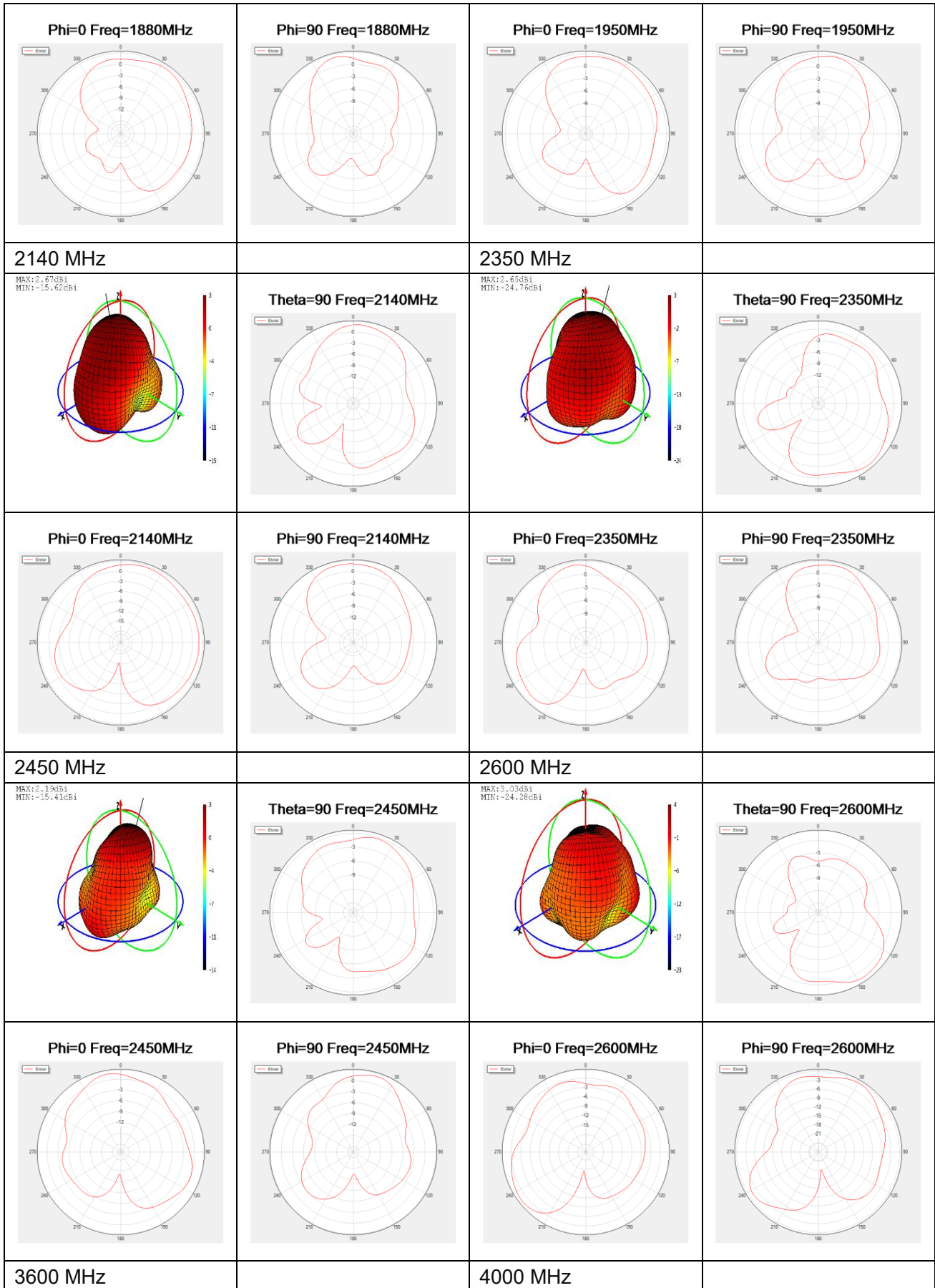


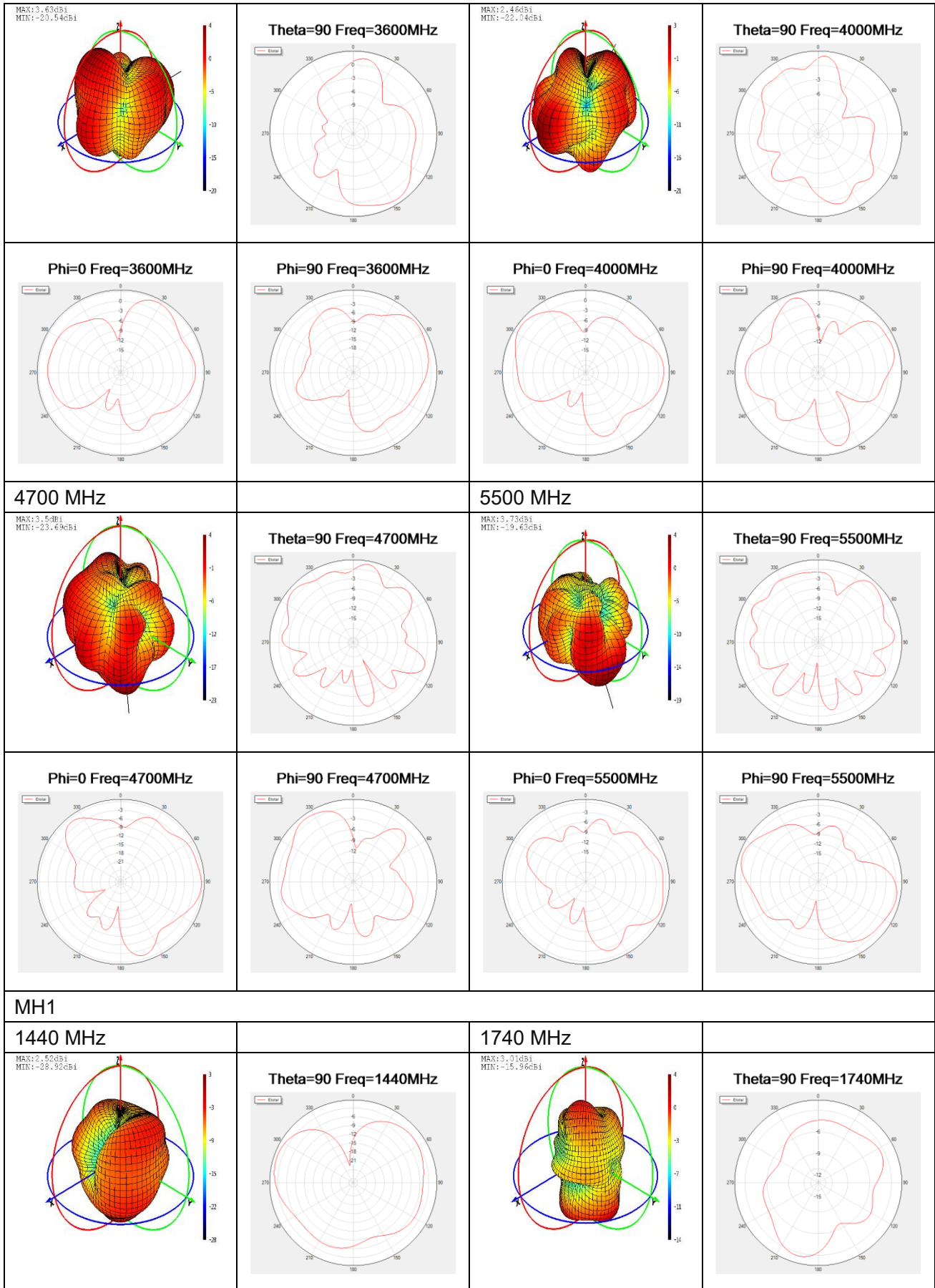


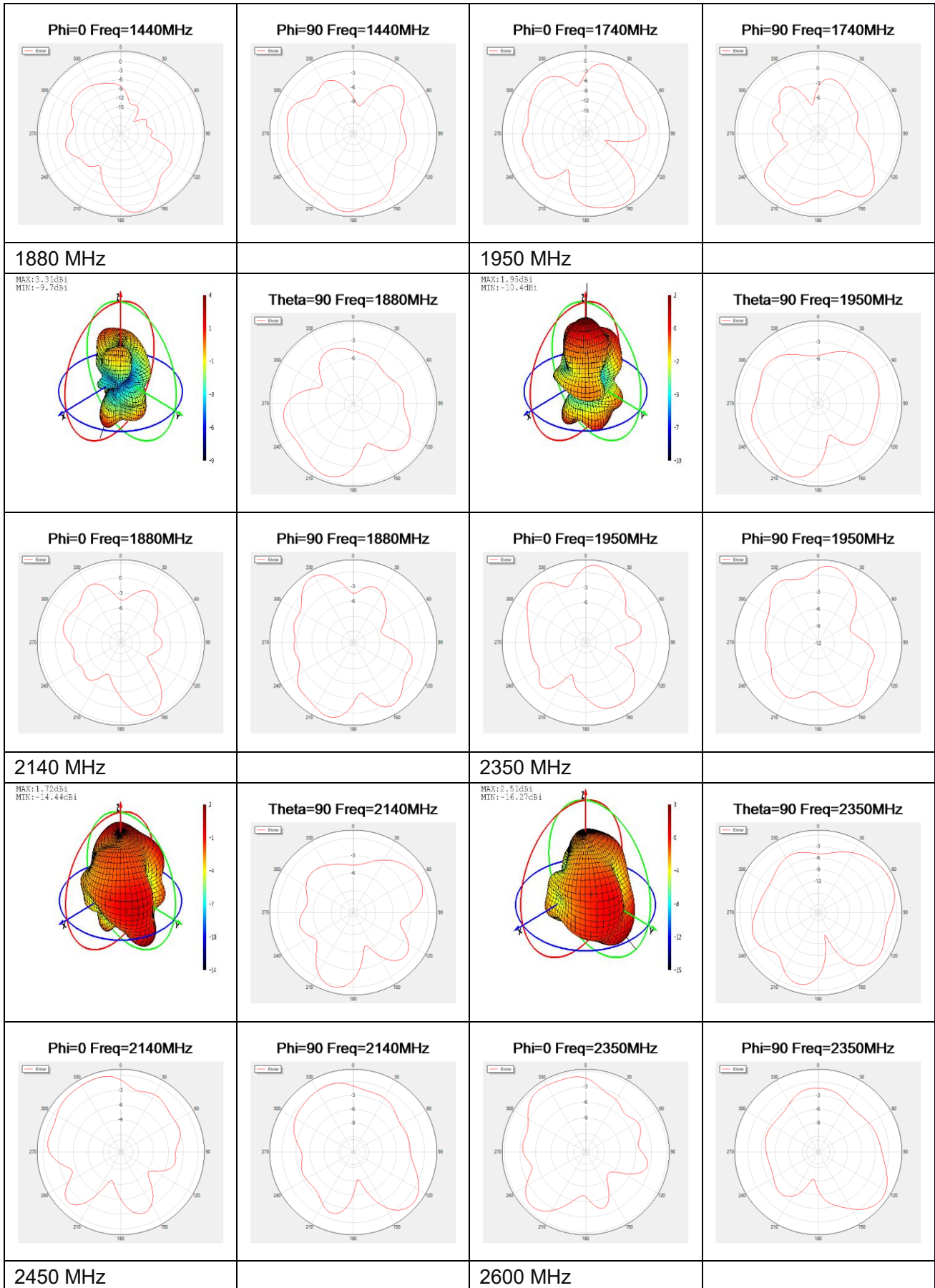


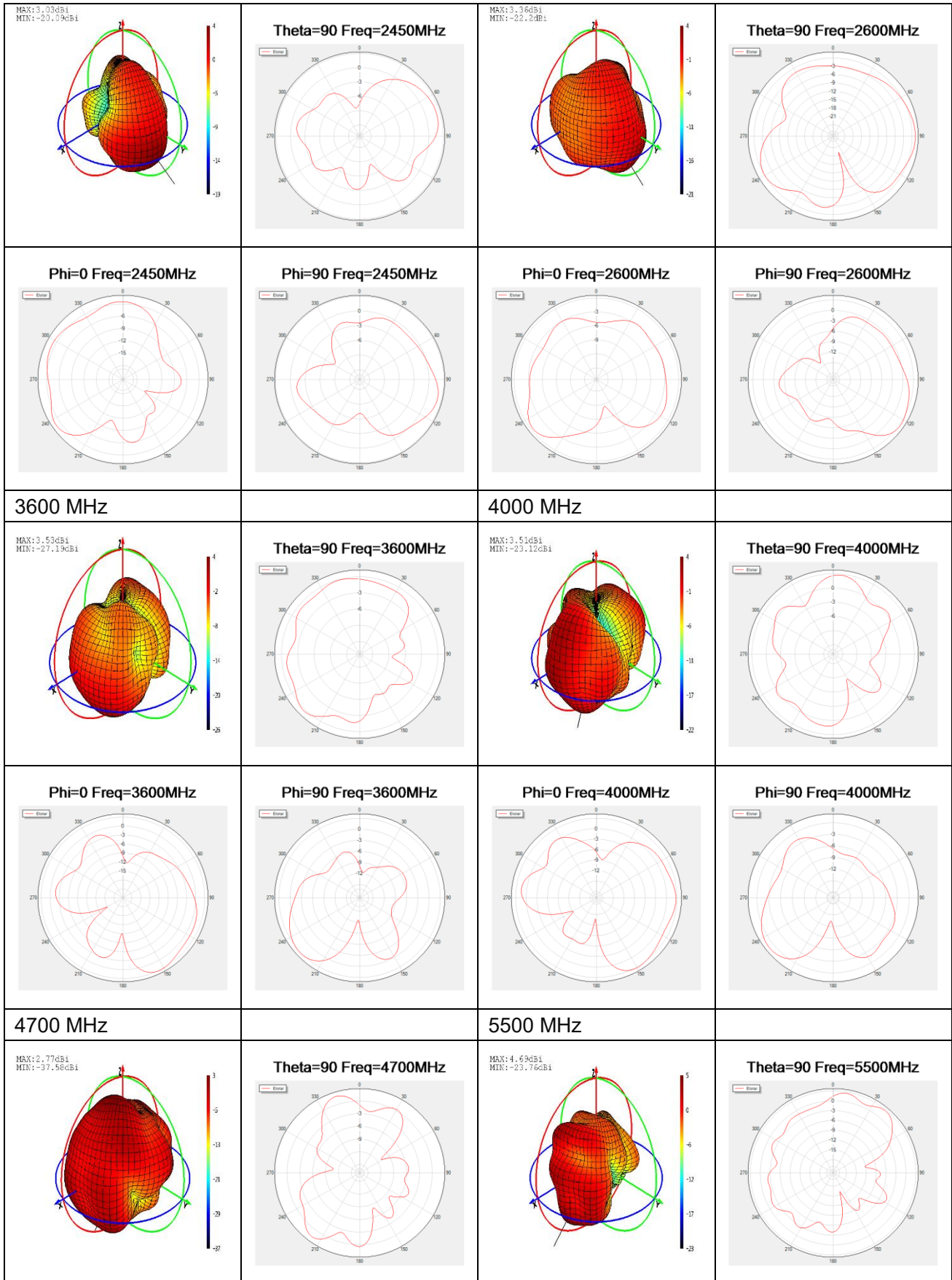


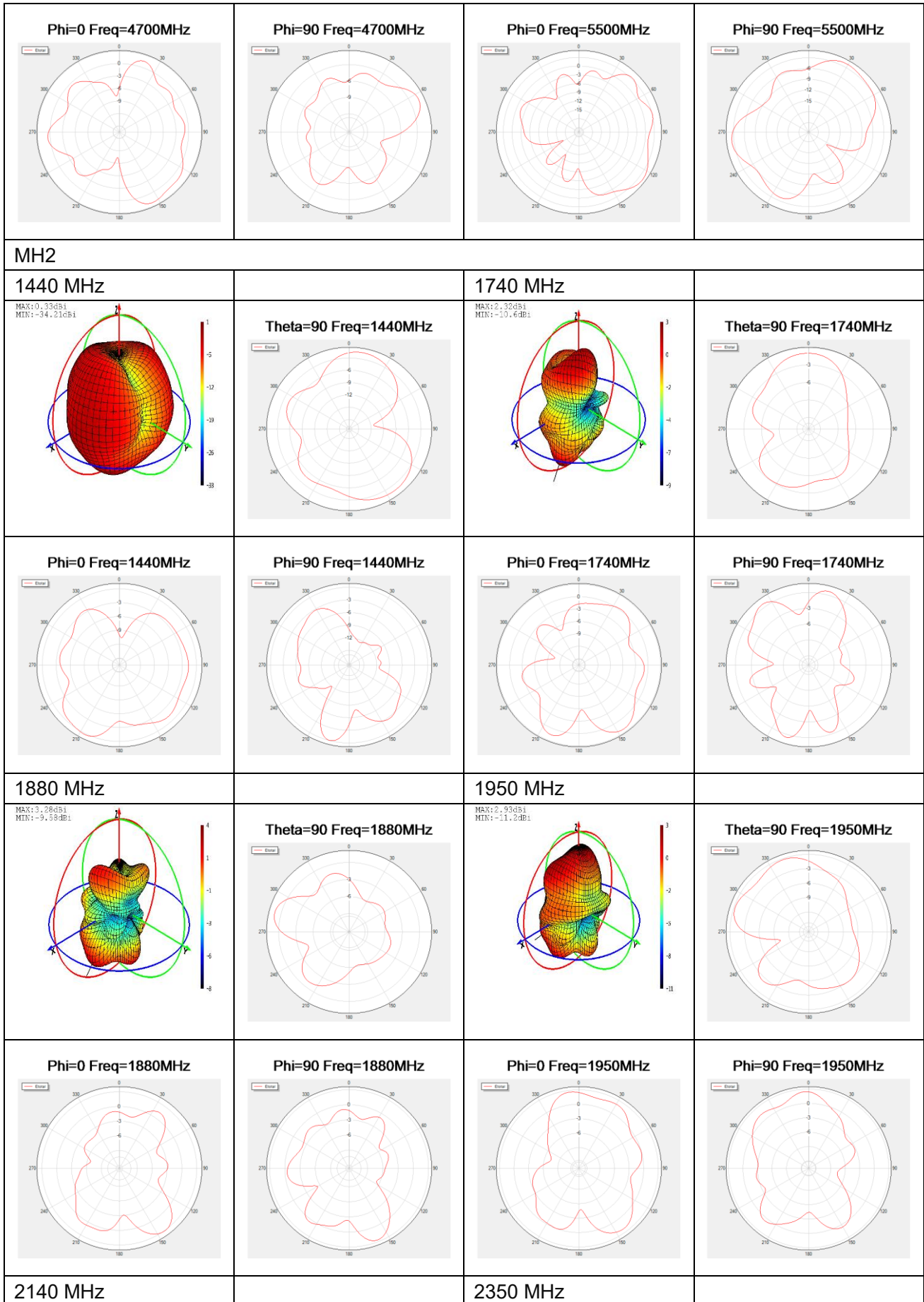


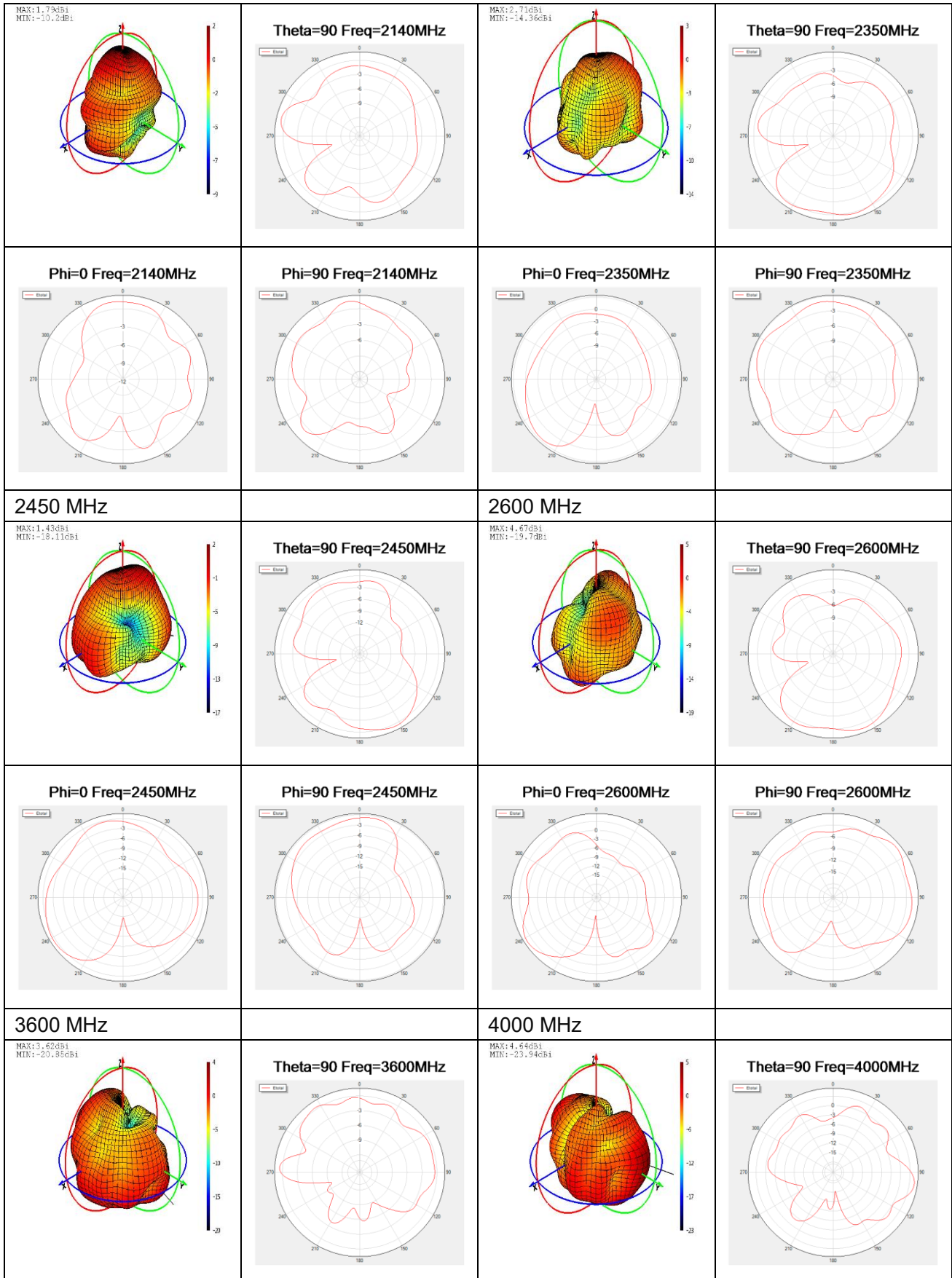


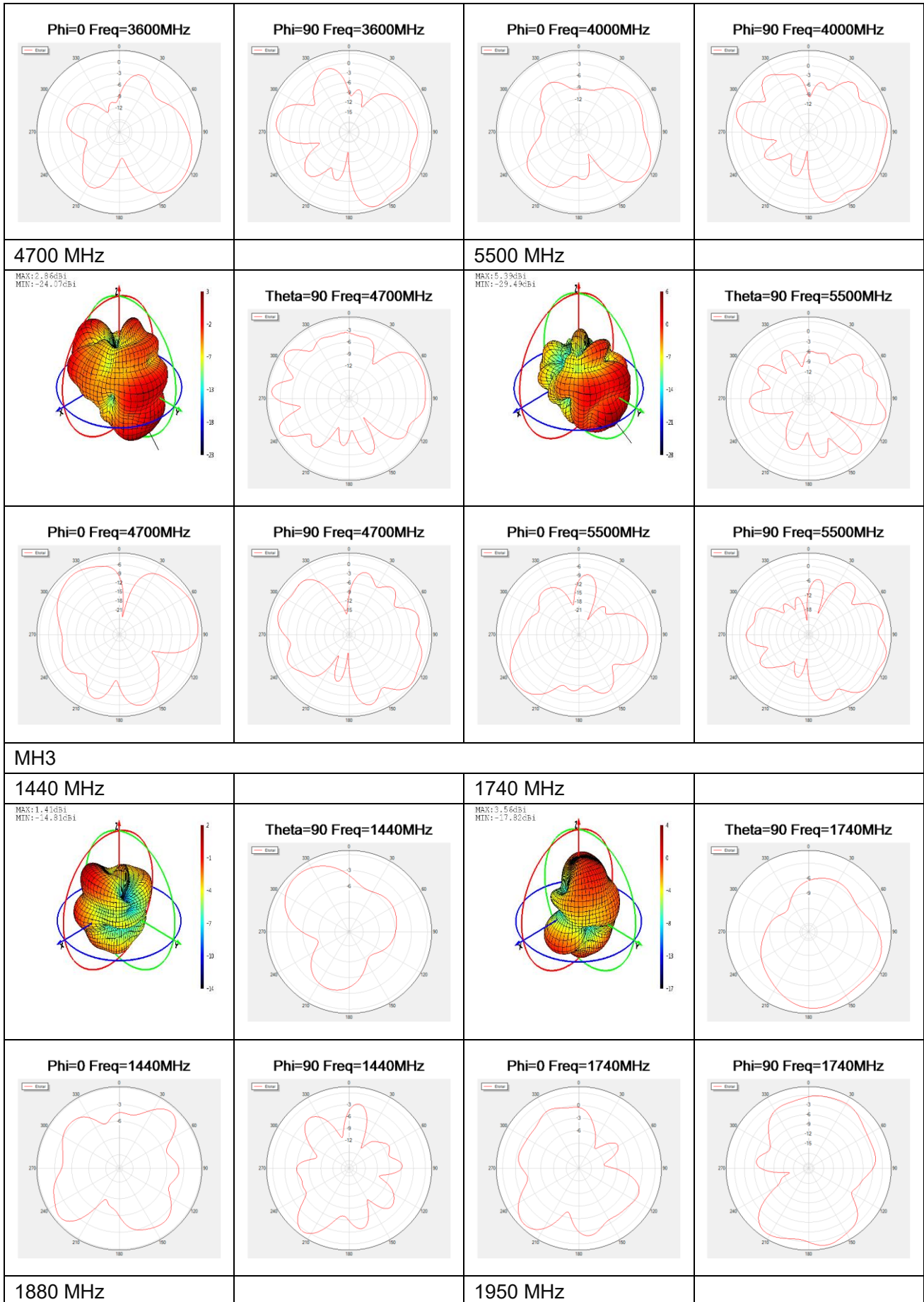


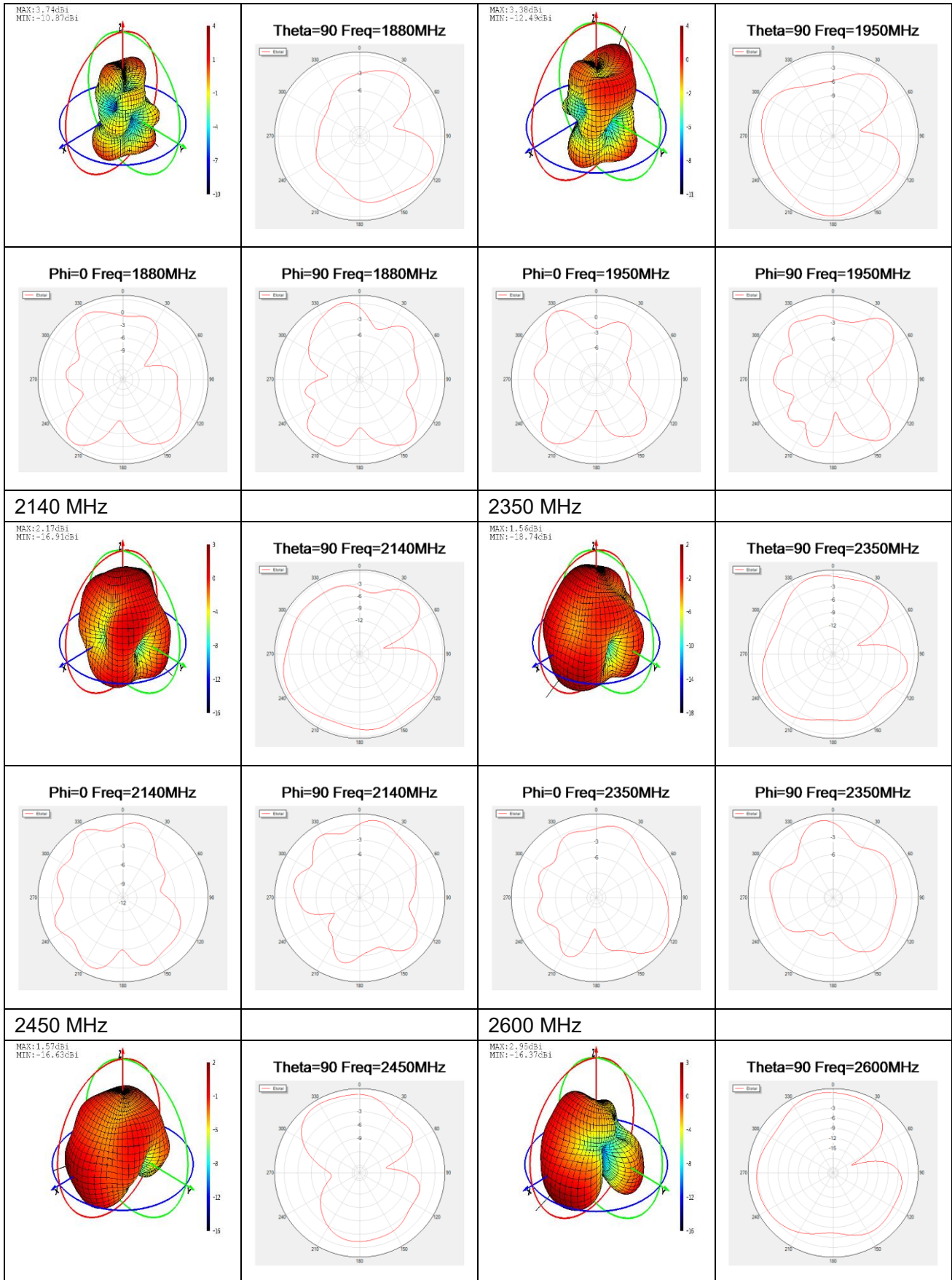


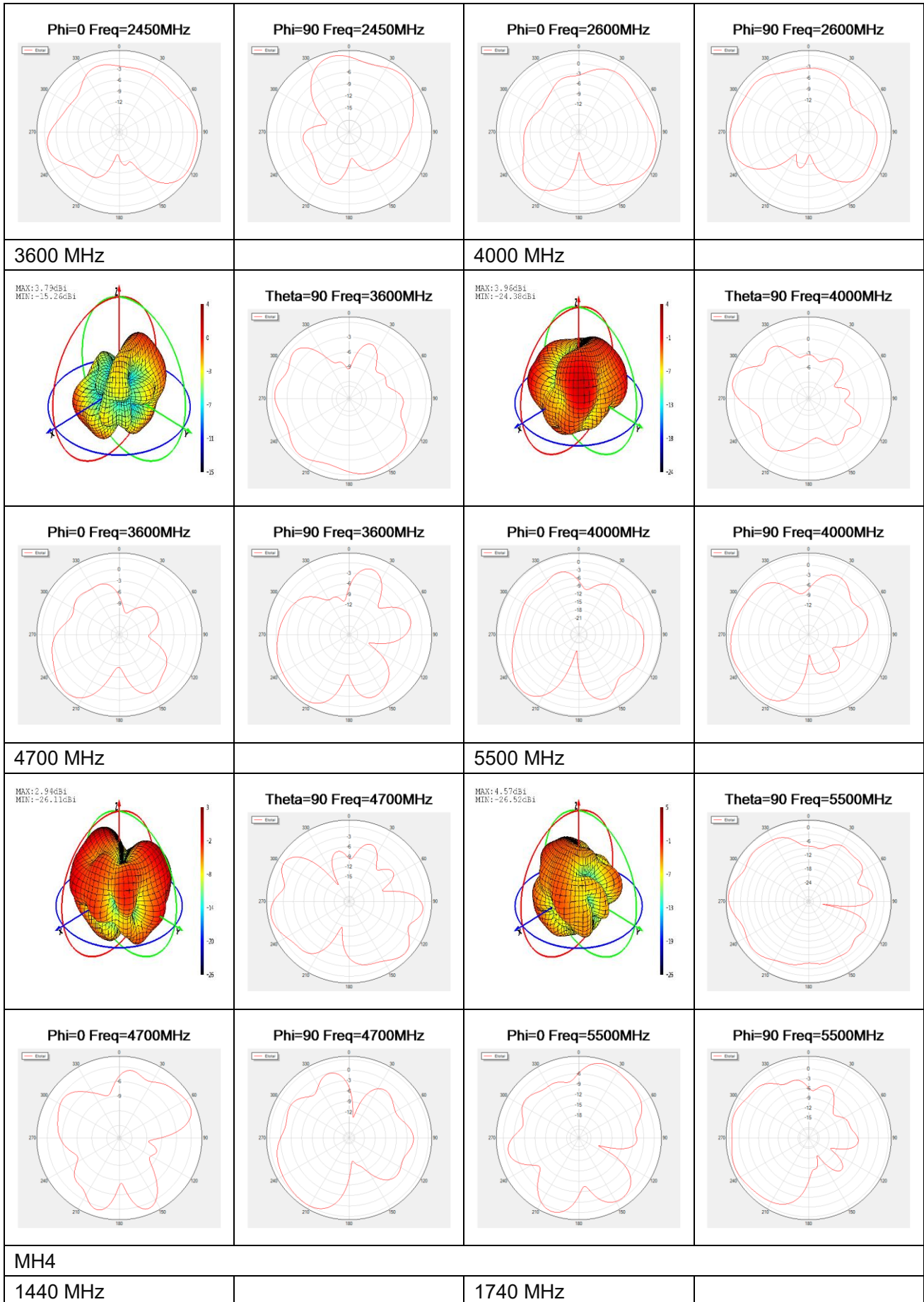


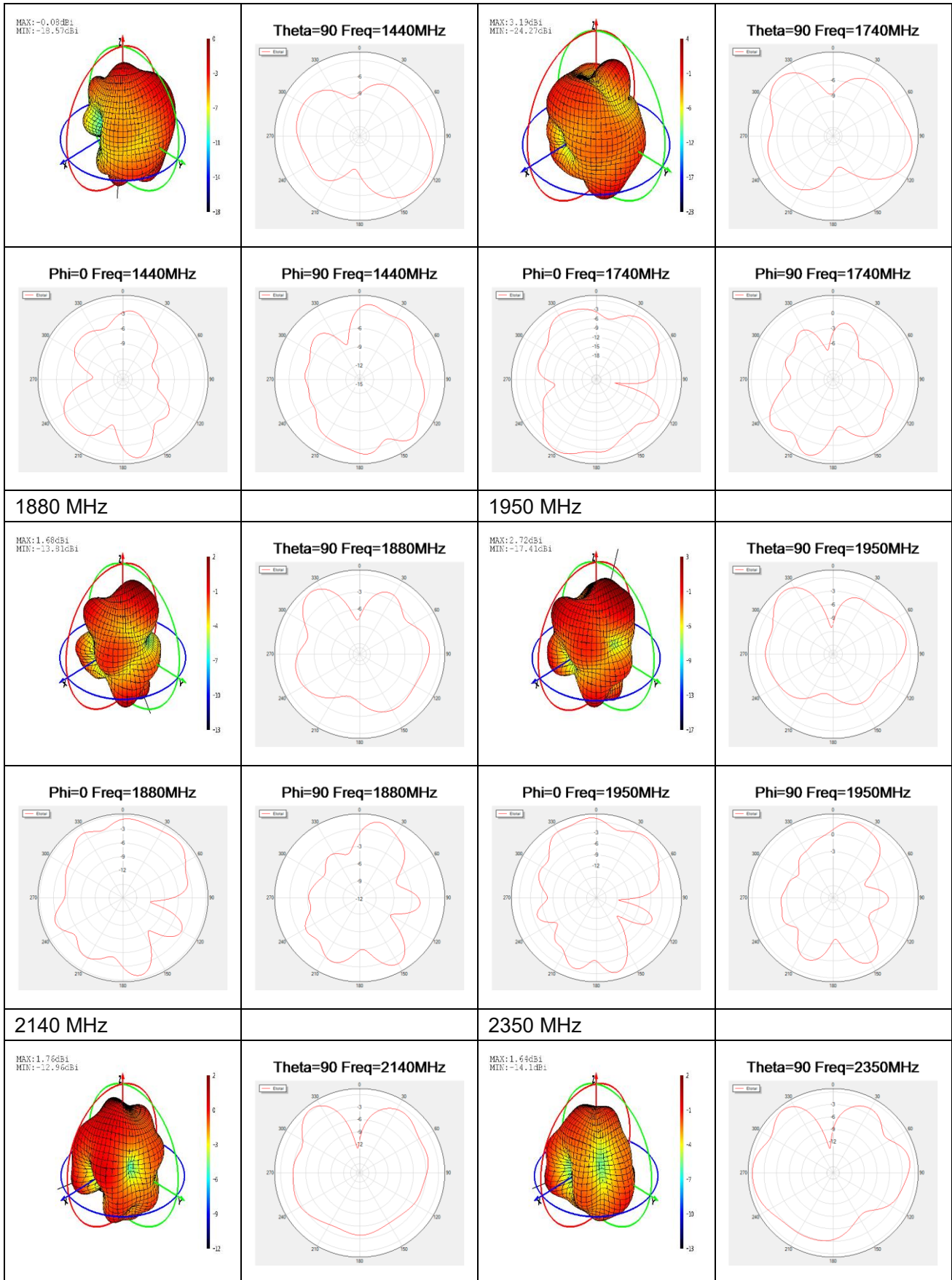


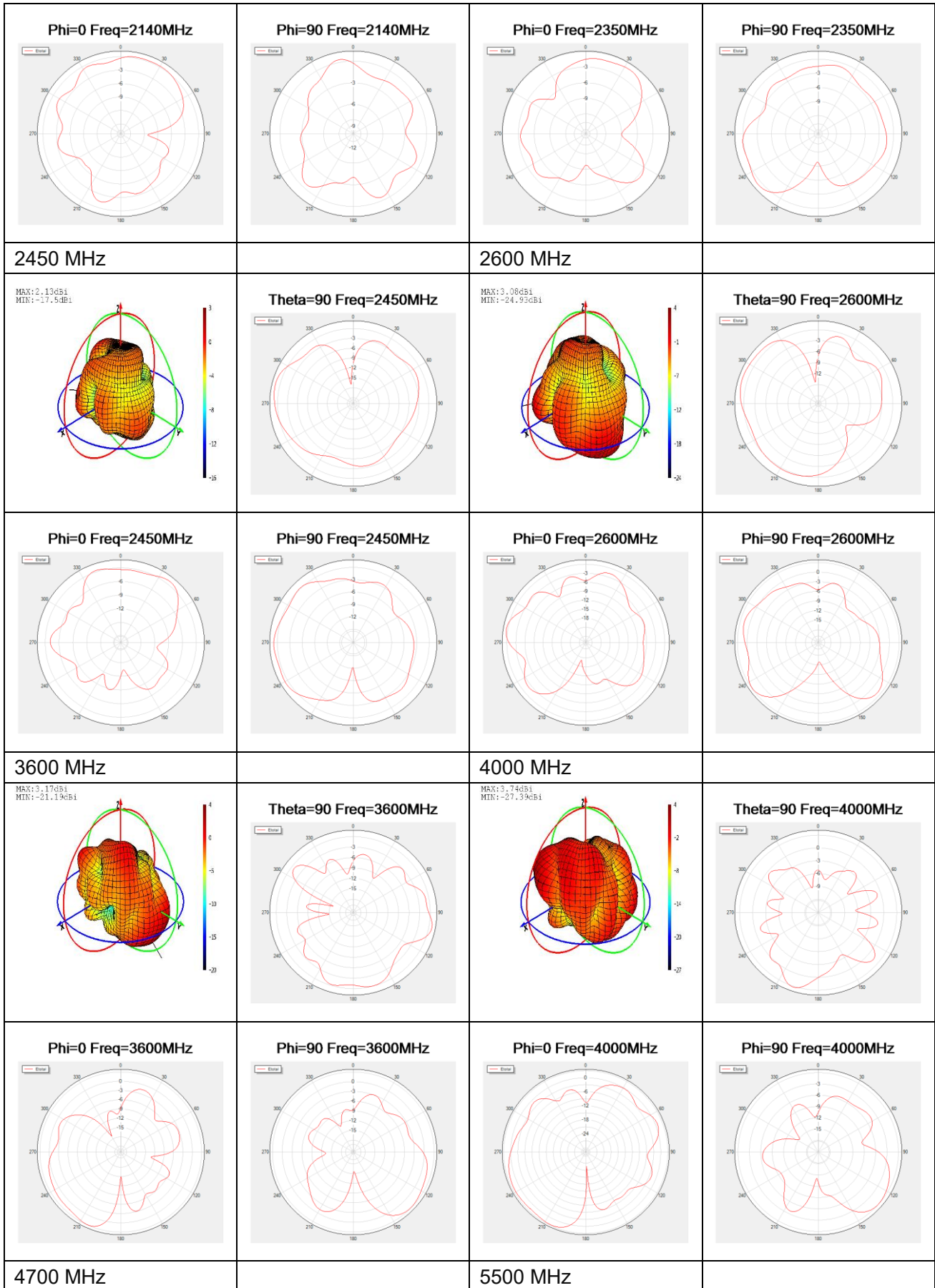


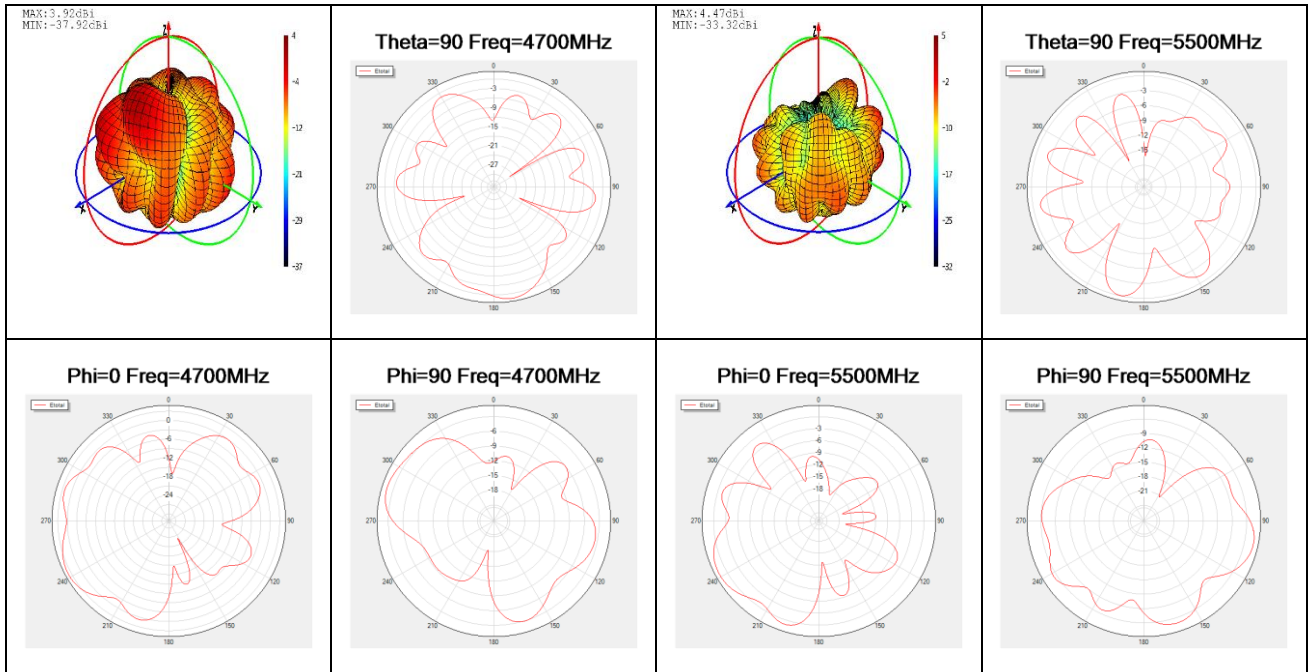




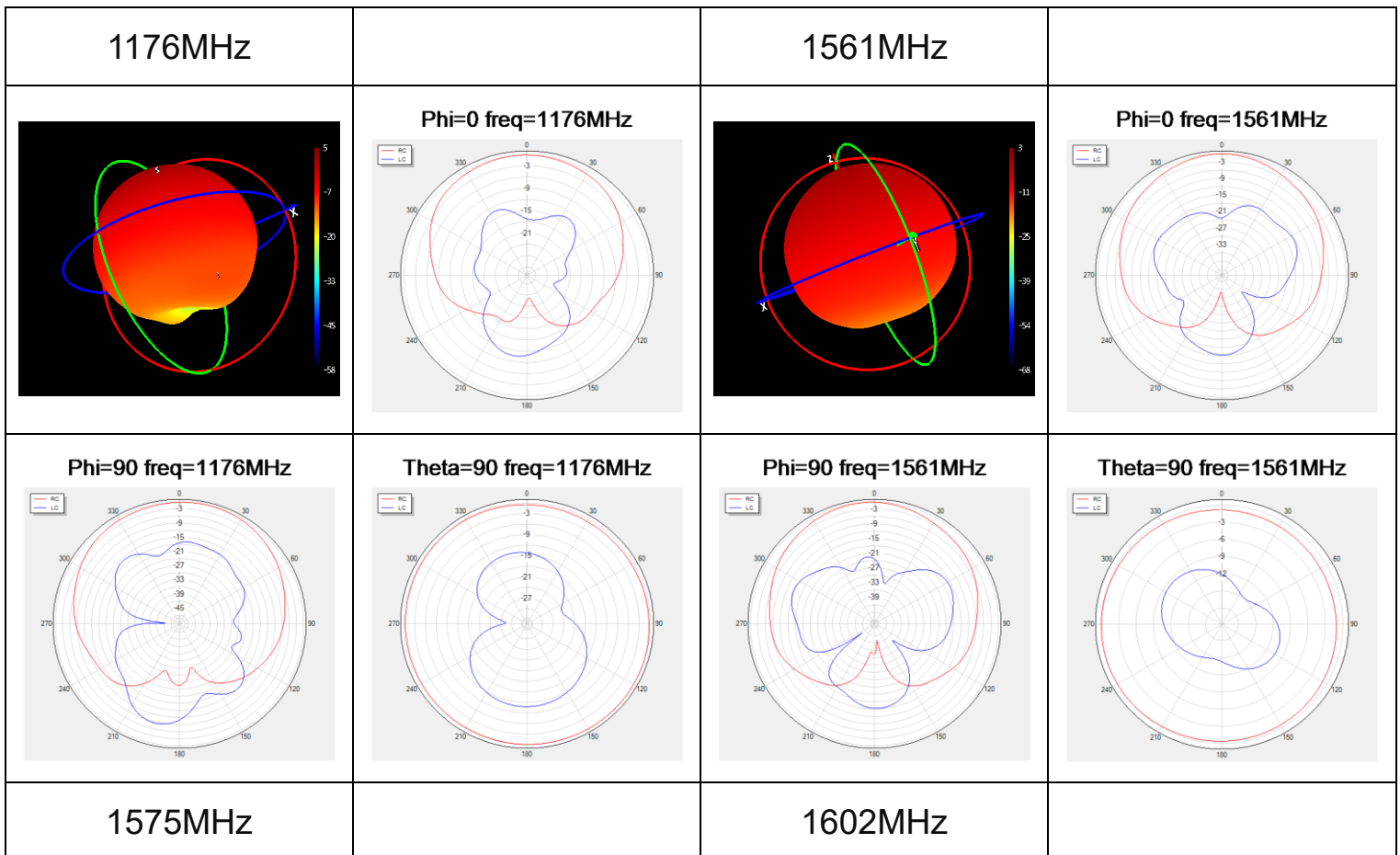


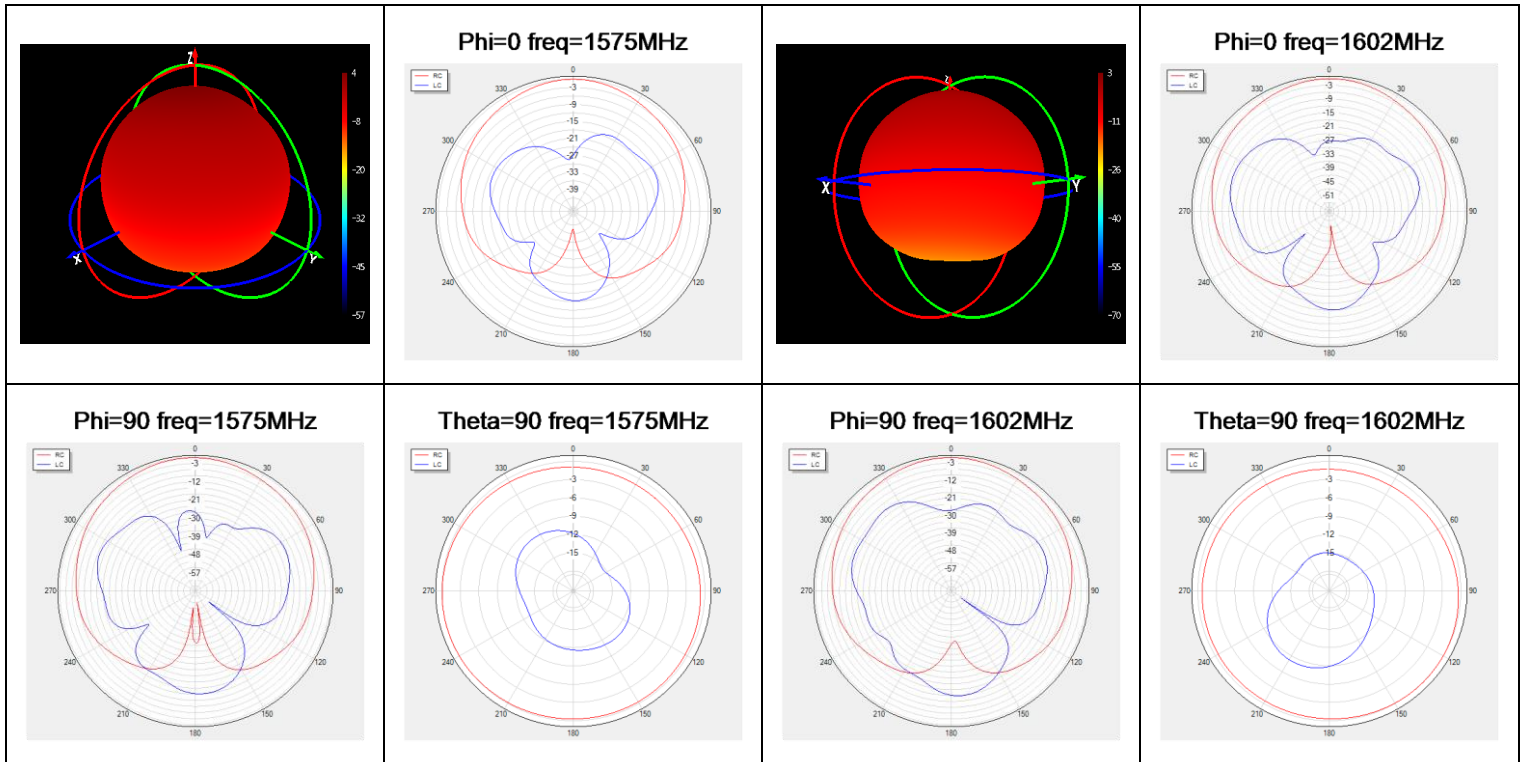




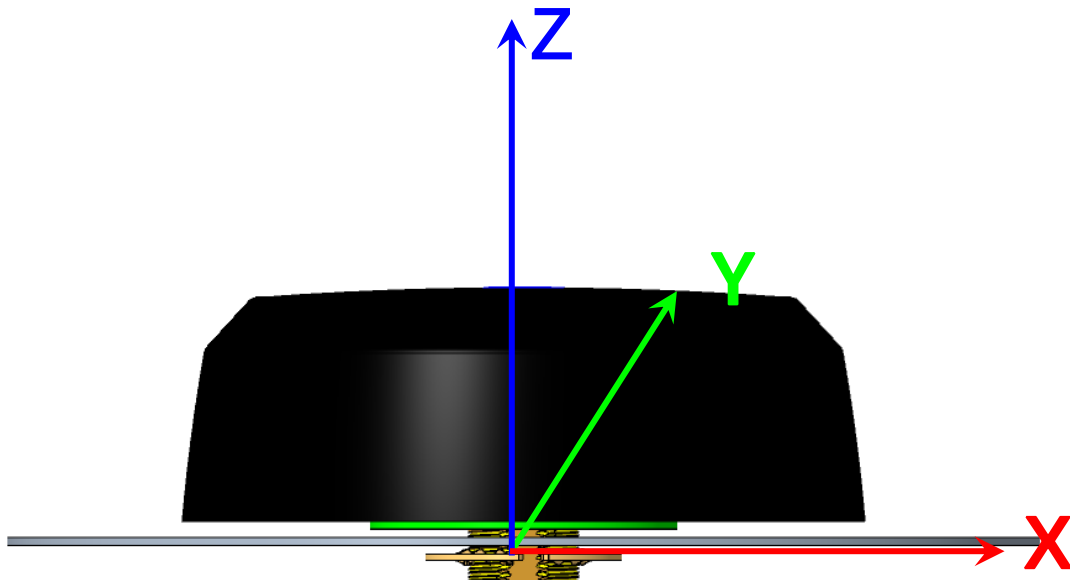


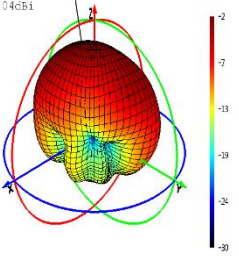
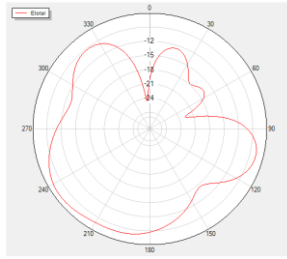
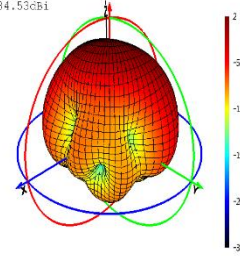
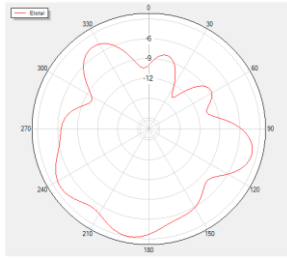
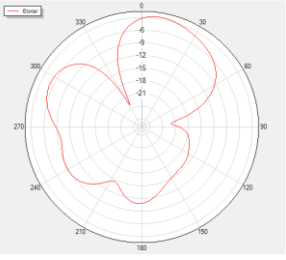
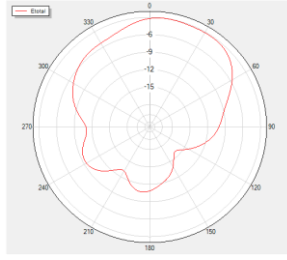
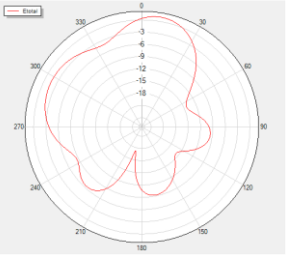
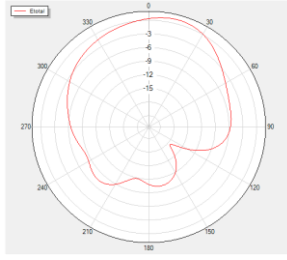
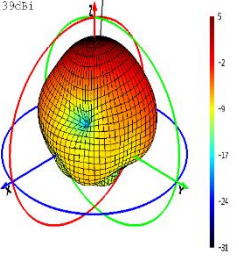
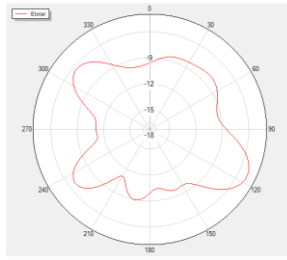
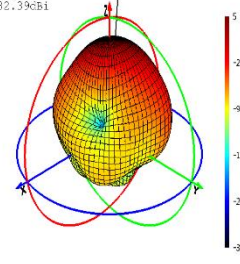
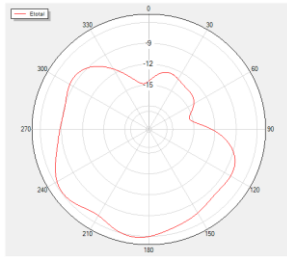
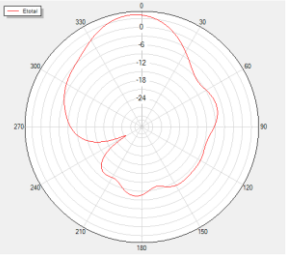
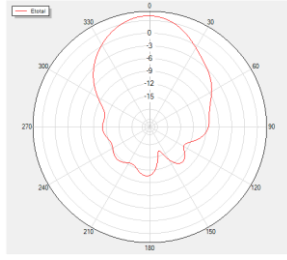
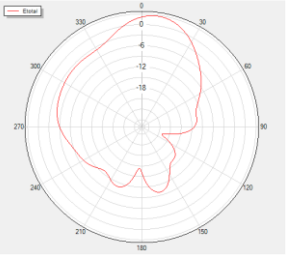
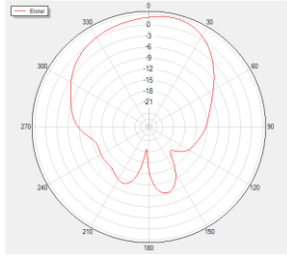
● GNSS

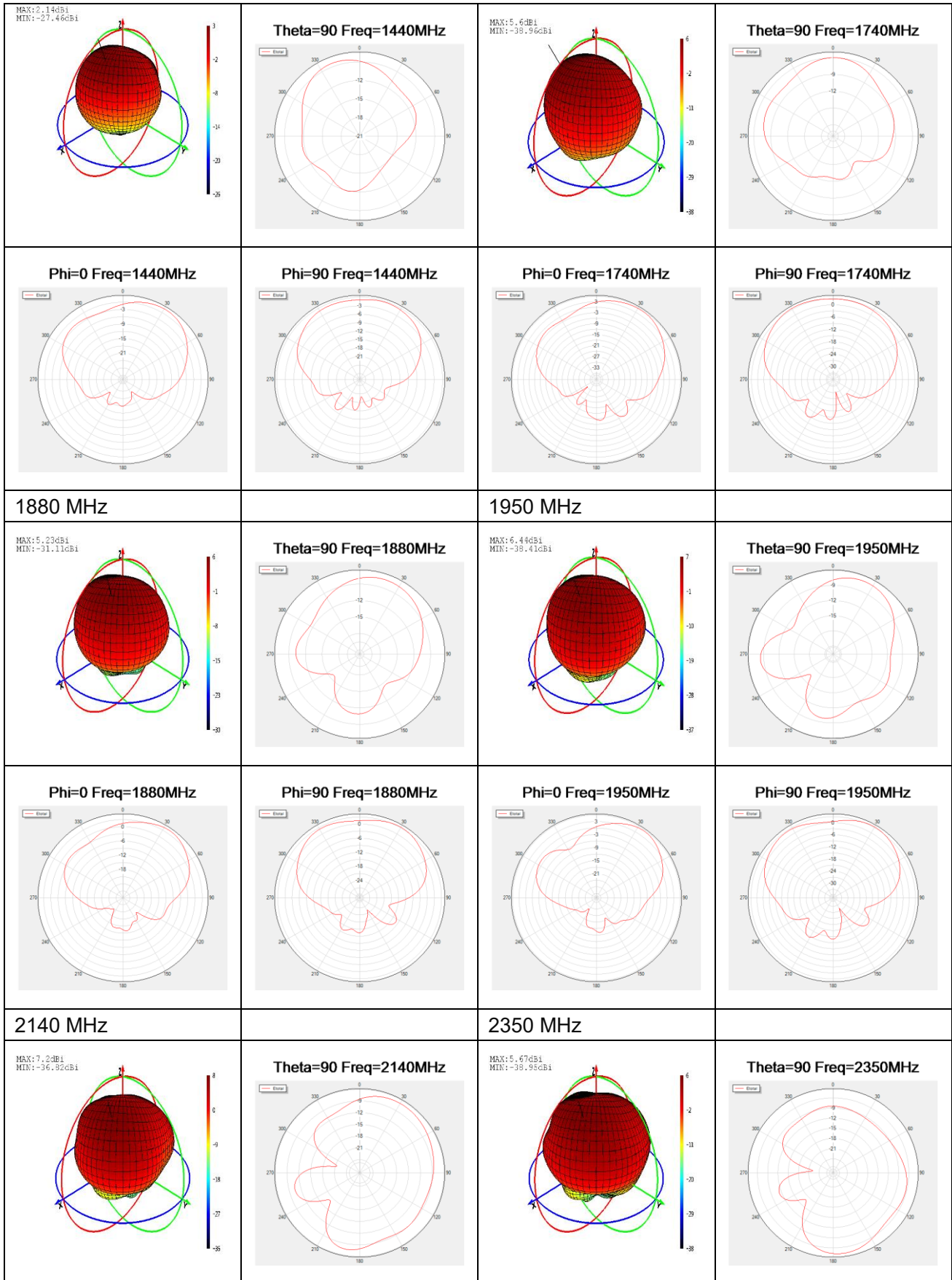


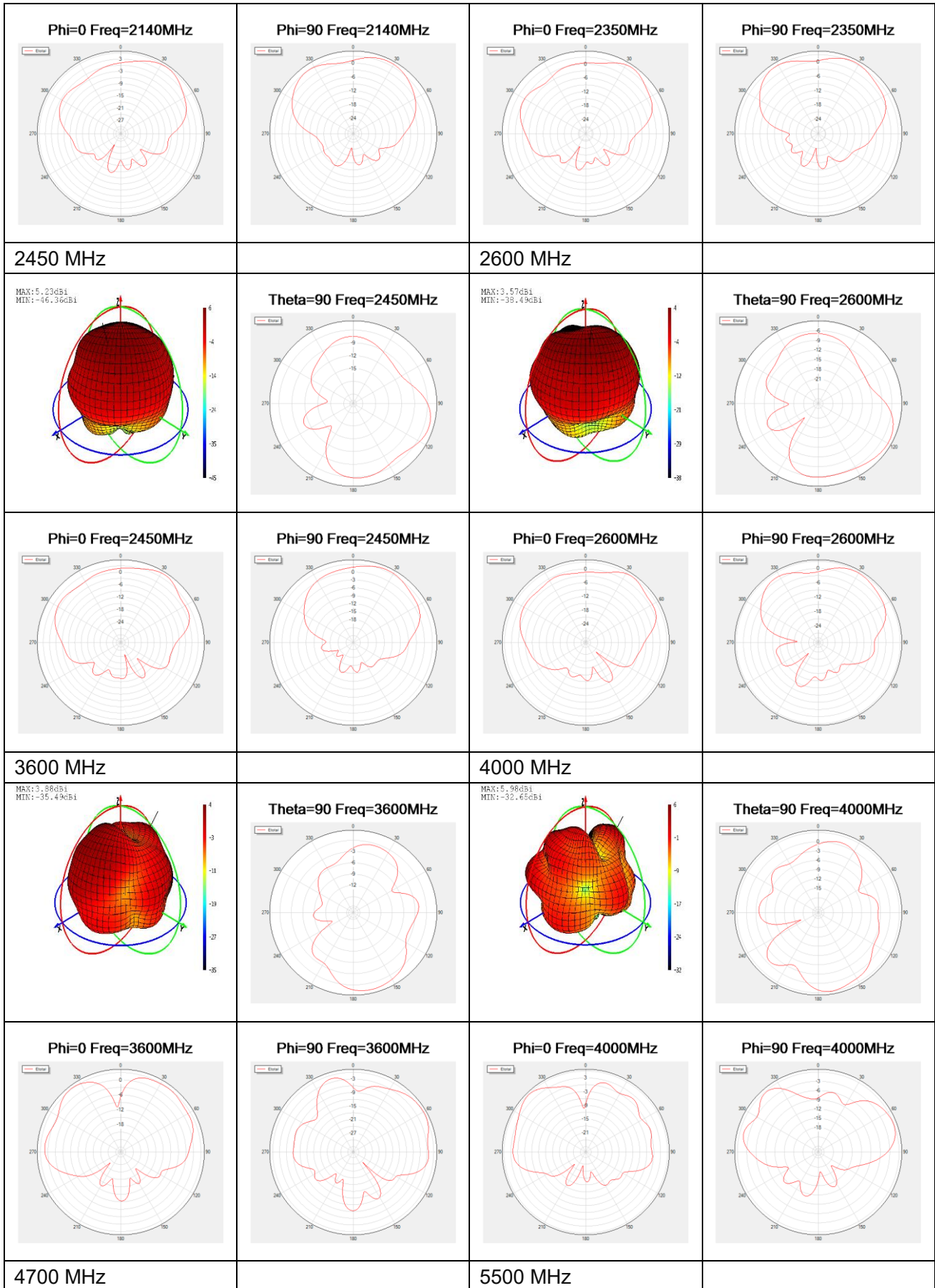


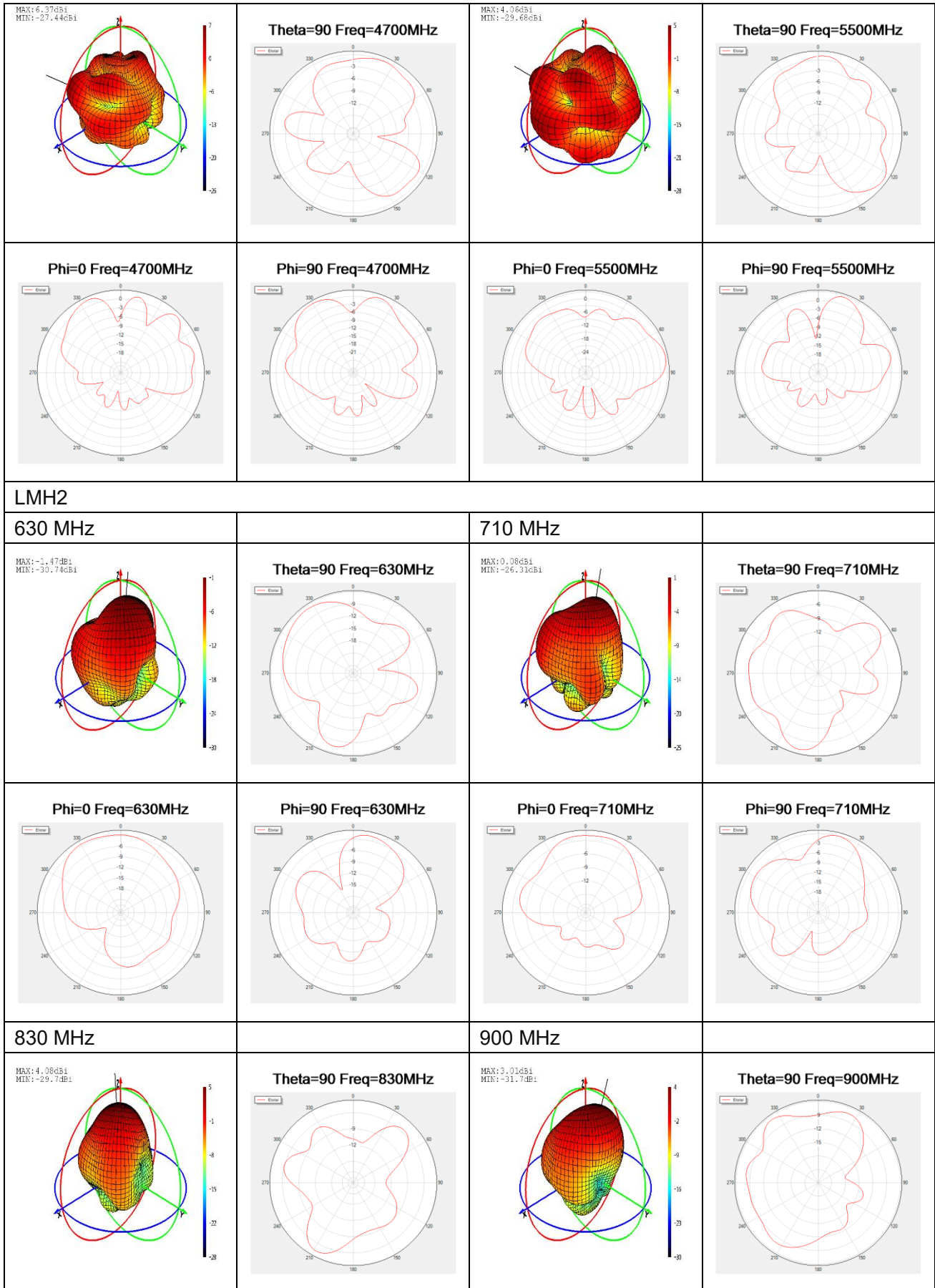
3.2.4.2 Test Status: On 300 × 400 mm Metal Plane

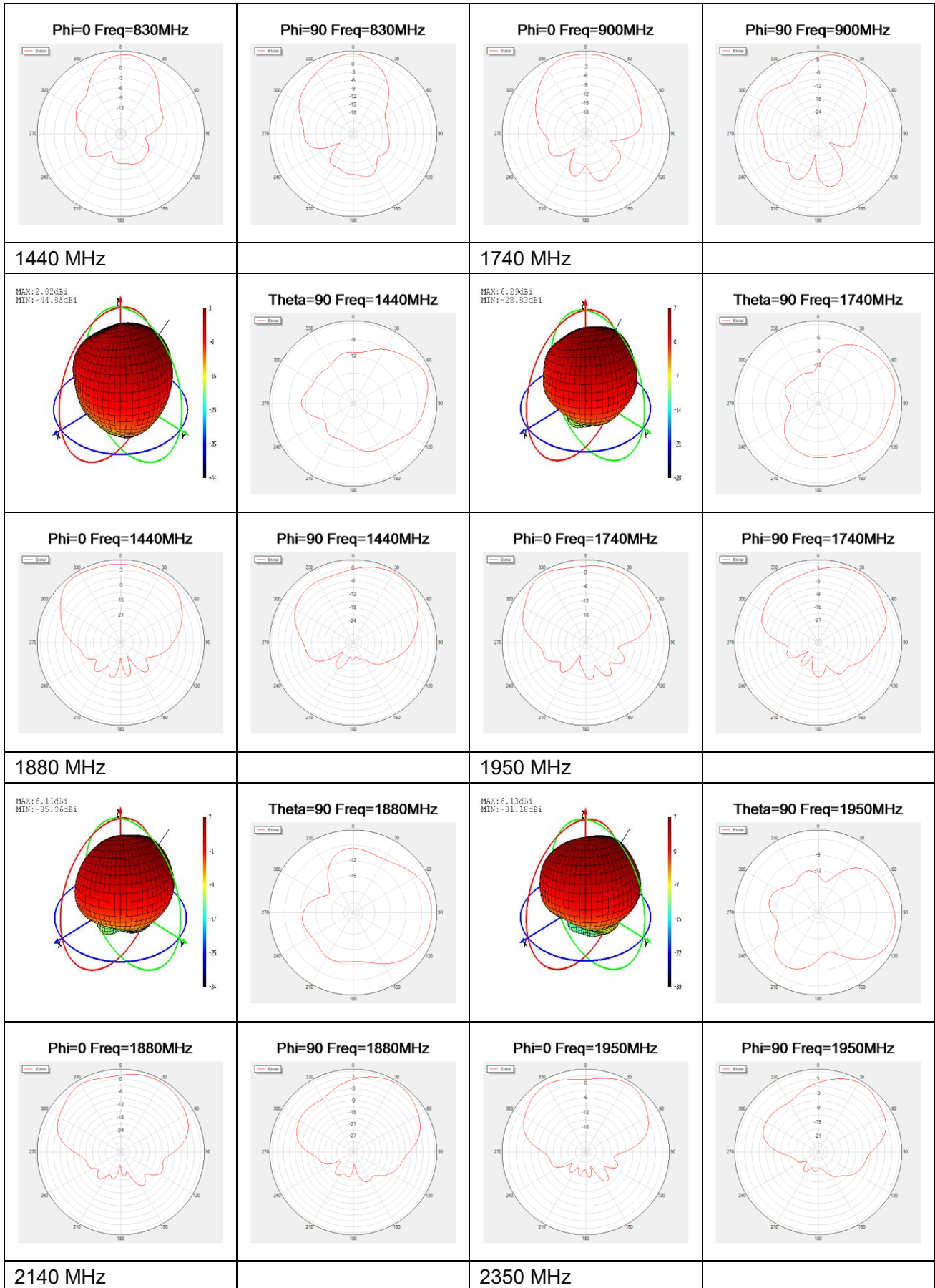


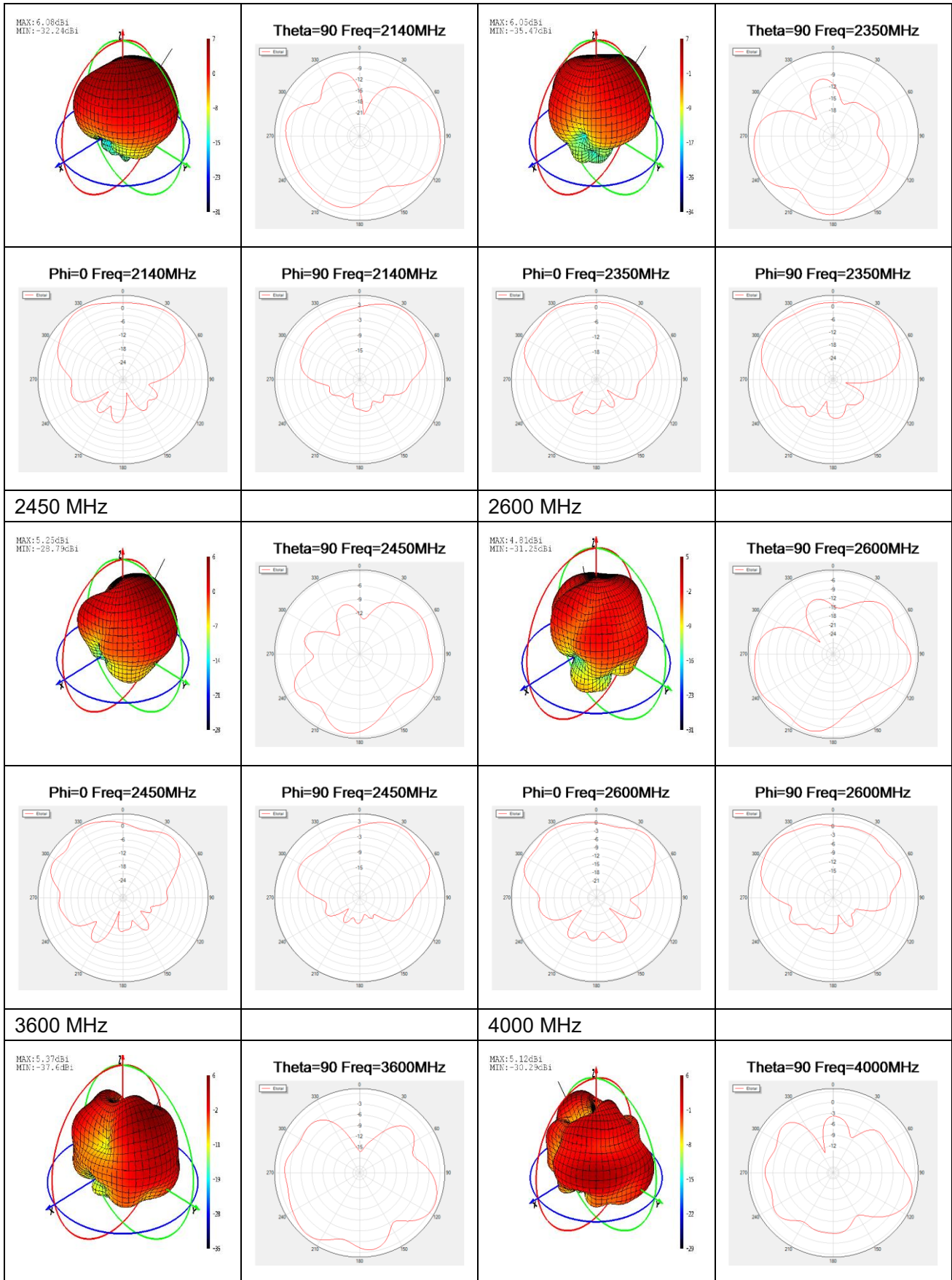
LMH1			
630 MHz		710 MHz	
<p>MAX: -2.53dbi MIN: -31.04cbi</p> 	<p>Theta=90 Freq=630MHz</p> 	<p>MAX: 1.18dbi MIN: -34.53cbi</p> 	<p>Theta=90 Freq=710MHz</p> 
<p>Phi=0 Freq=630MHz</p> 	<p>Phi=90 Freq=630MHz</p> 	<p>Phi=0 Freq=710MHz</p> 	<p>Phi=90 Freq=710MHz</p> 
830 MHz		900 MHz	
<p>MAX: 4.39dbi MIN: -32.39cbi</p> 	<p>Theta=90 Freq=830MHz</p> 	<p>MAX: 4.39dbi MIN: -32.39cbi</p> 	<p>Theta=90 Freq=900MHz</p> 
<p>Phi=0 Freq=830MHz</p> 	<p>Phi=90 Freq=830MHz</p> 	<p>Phi=0 Freq=900MHz</p> 	<p>Phi=90 Freq=900MHz</p> 
1440 MHz		1740 MHz	

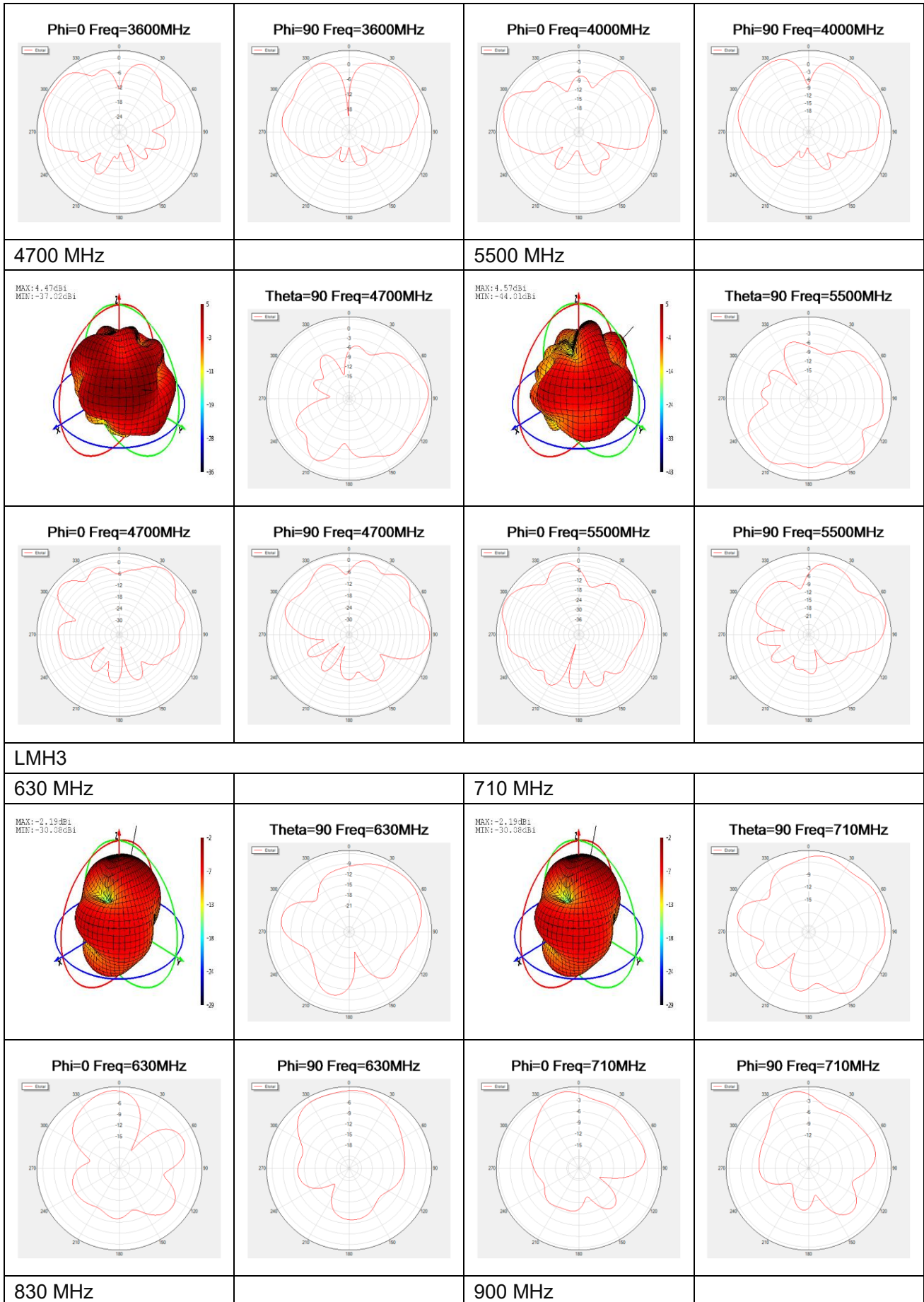


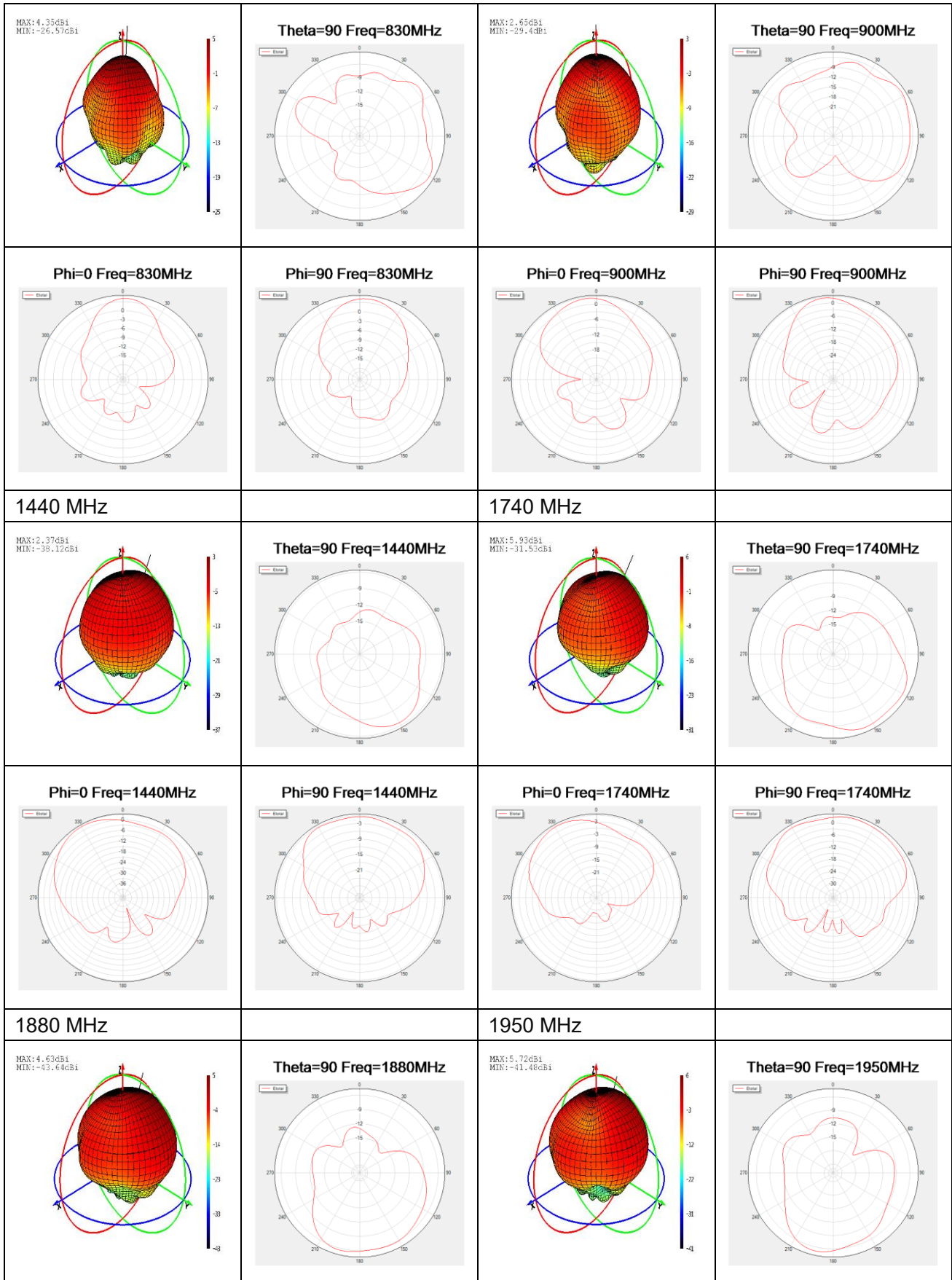


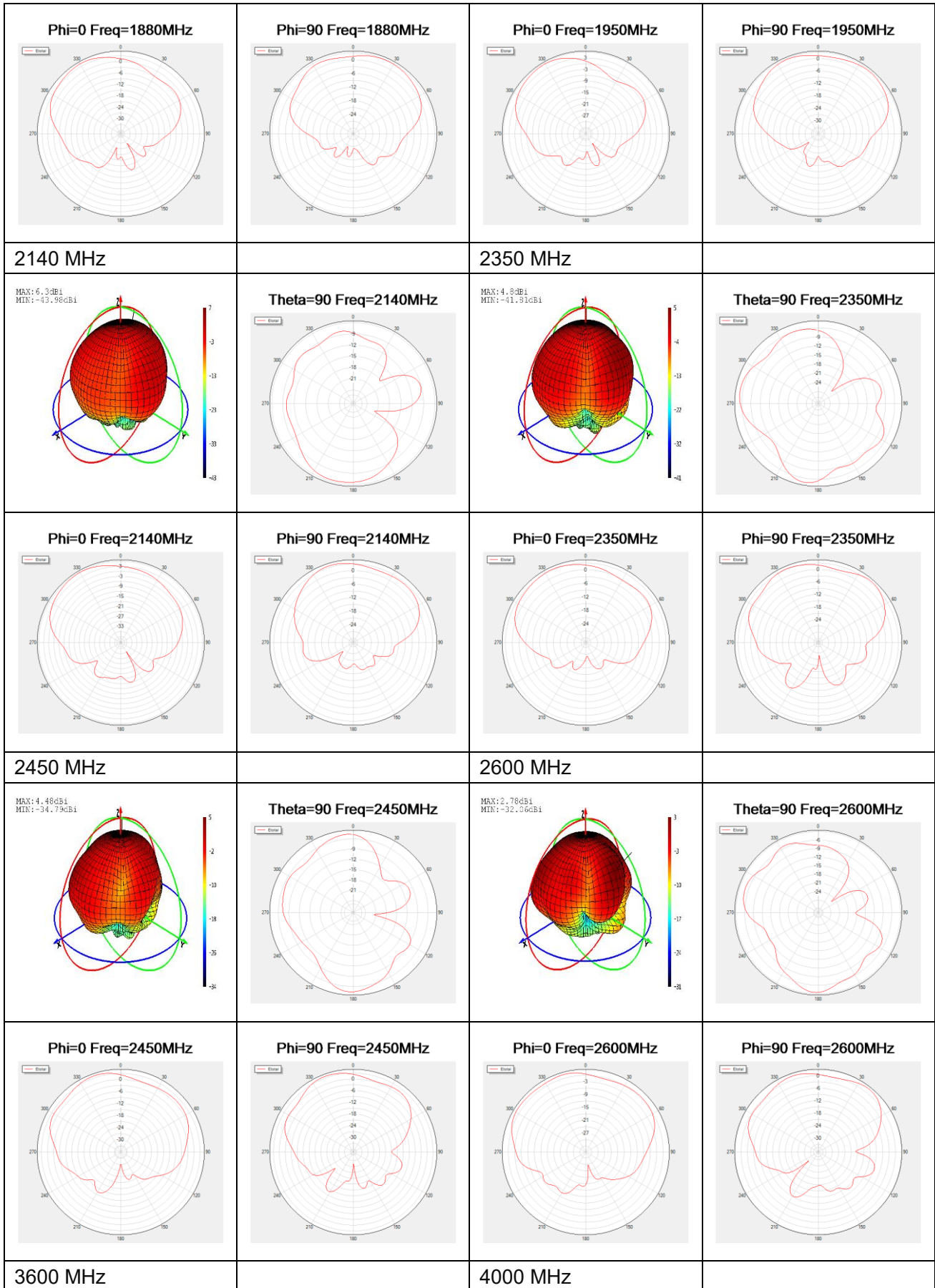


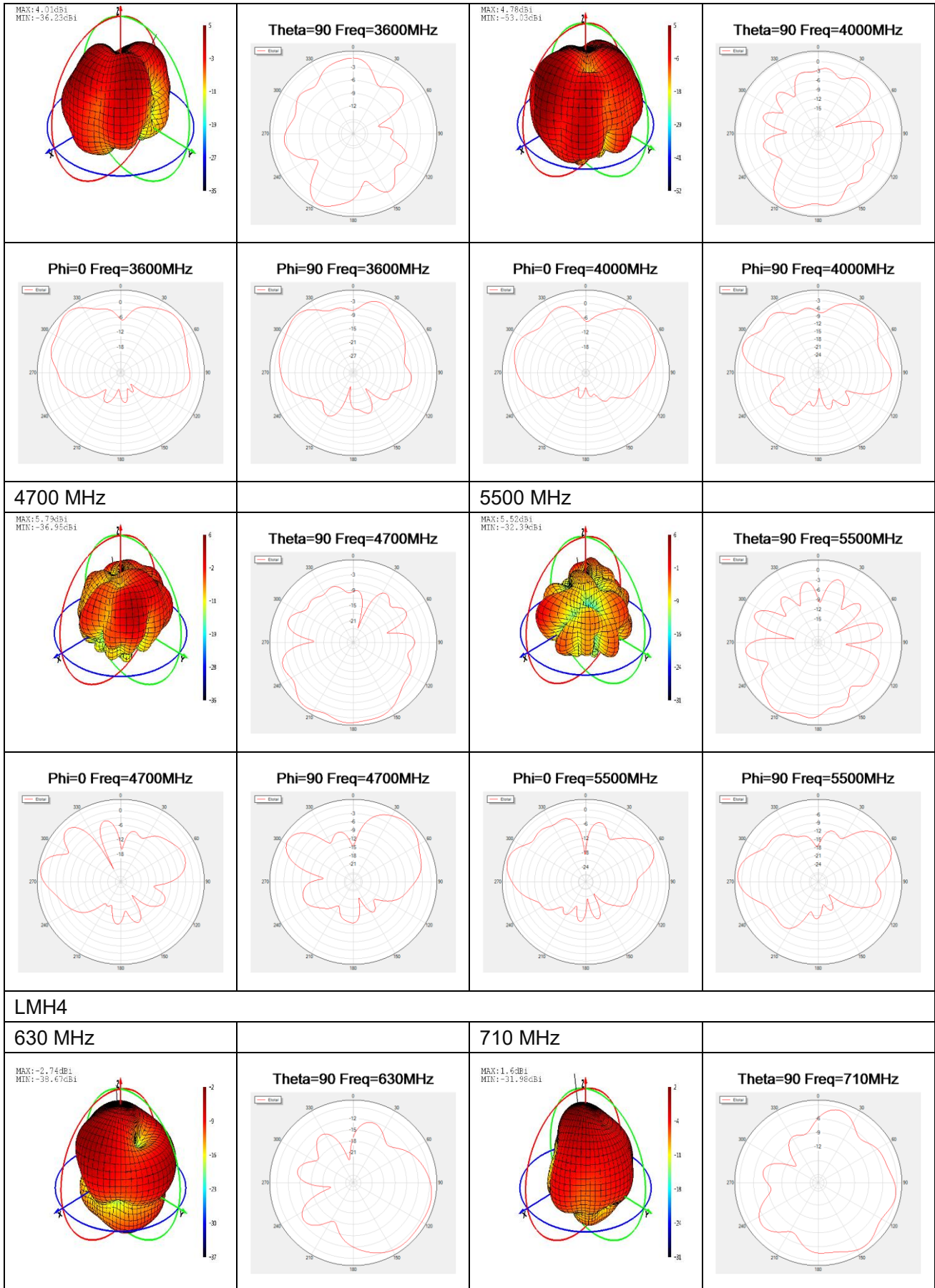


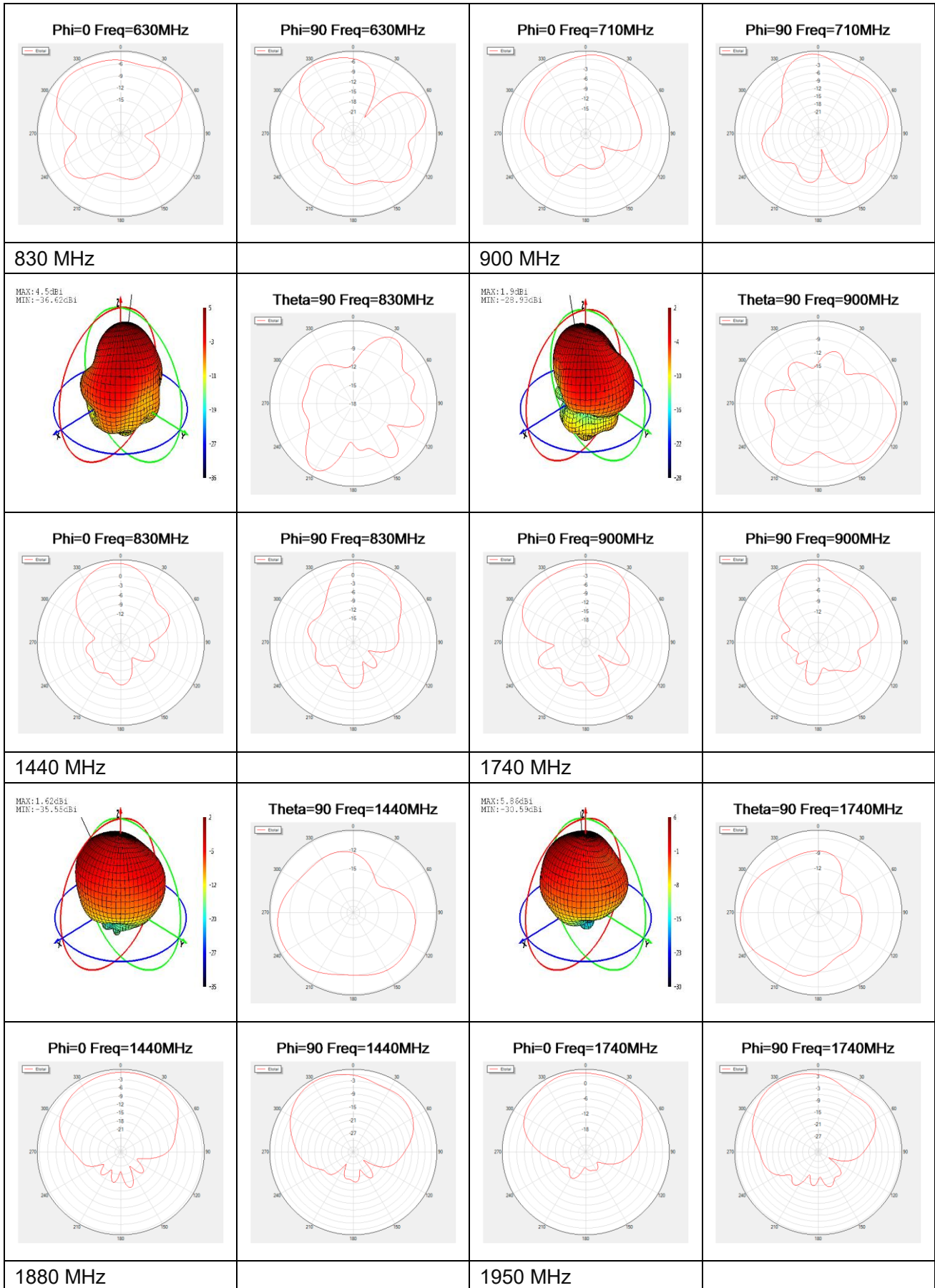


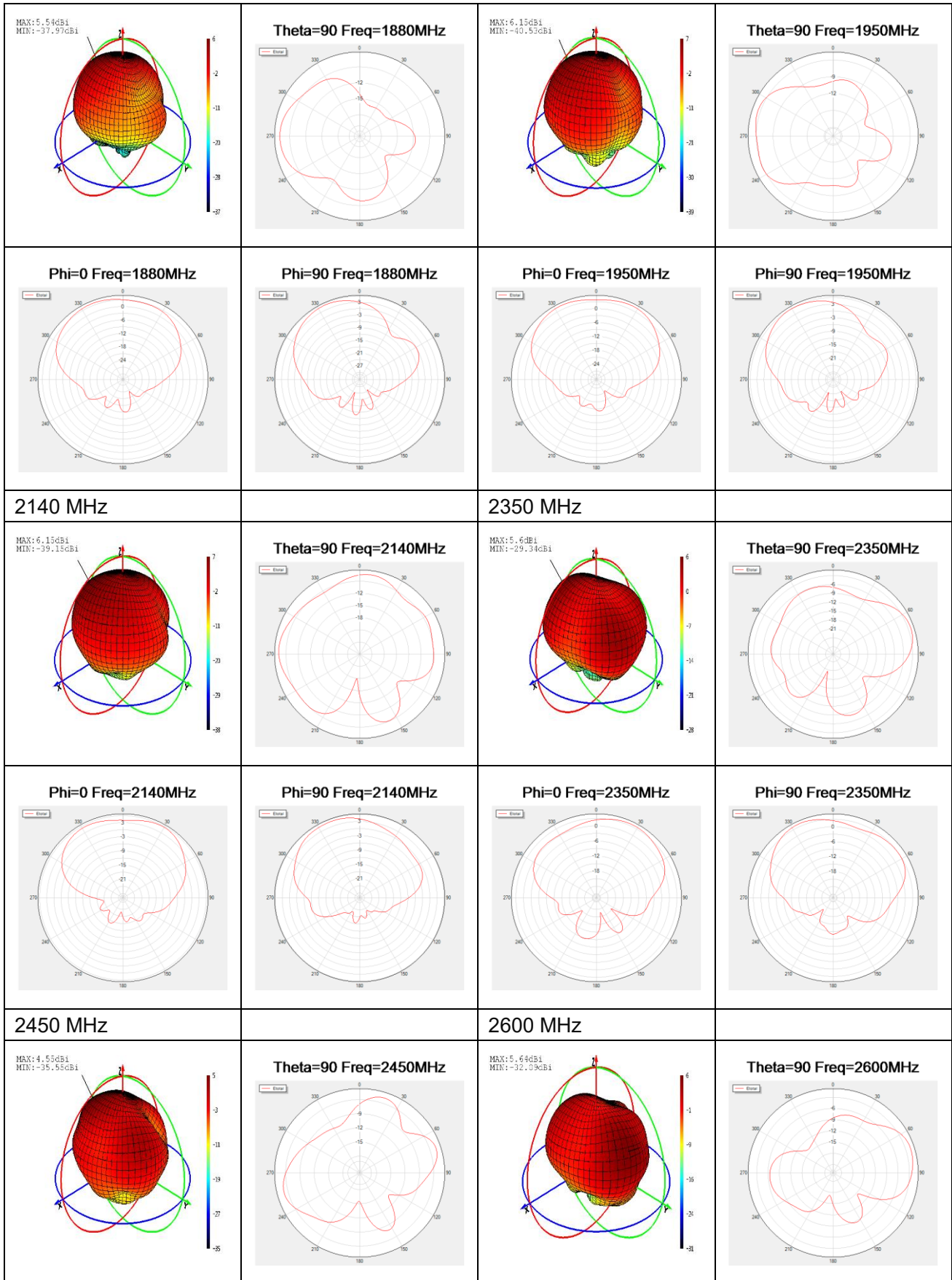


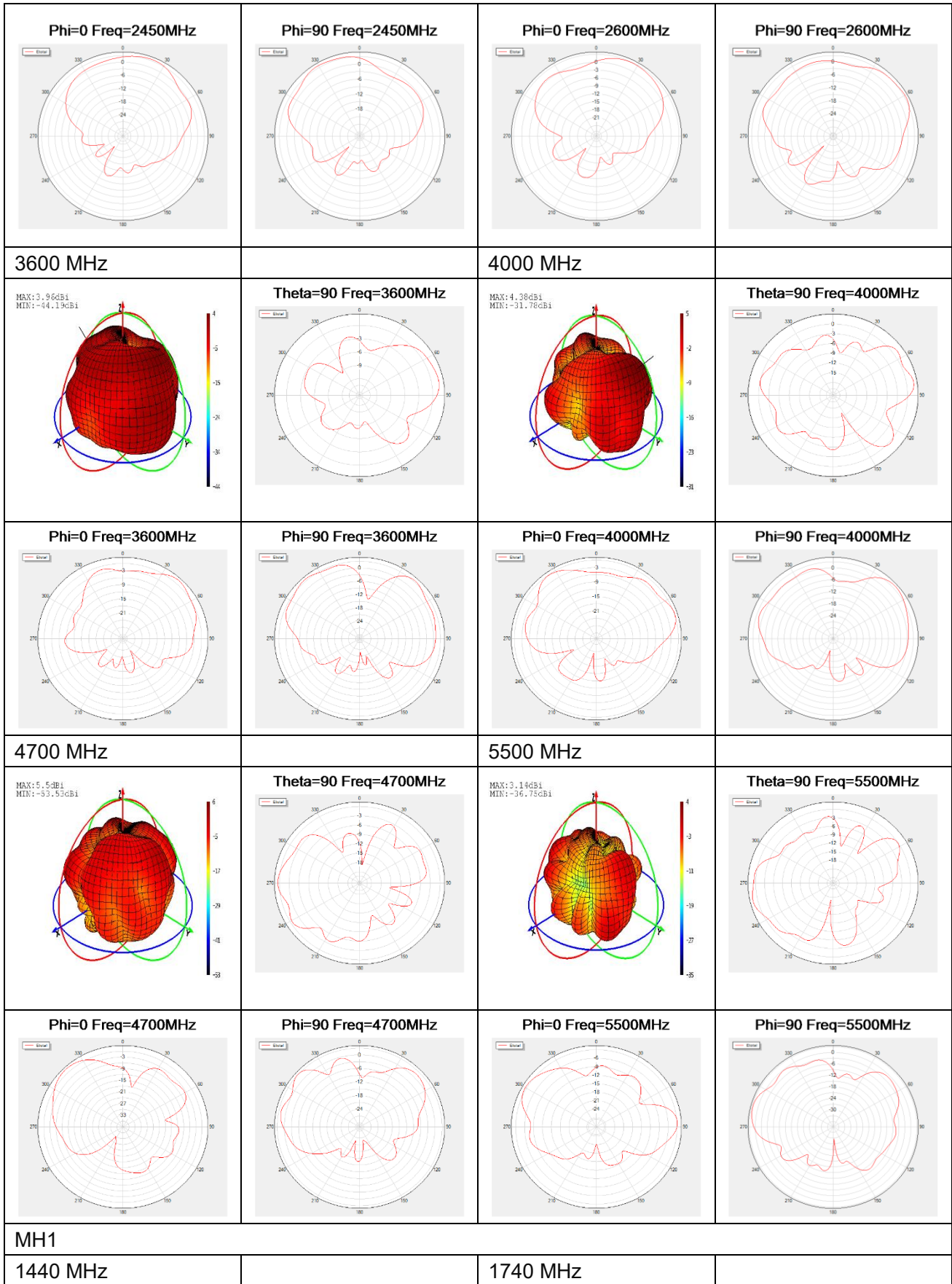


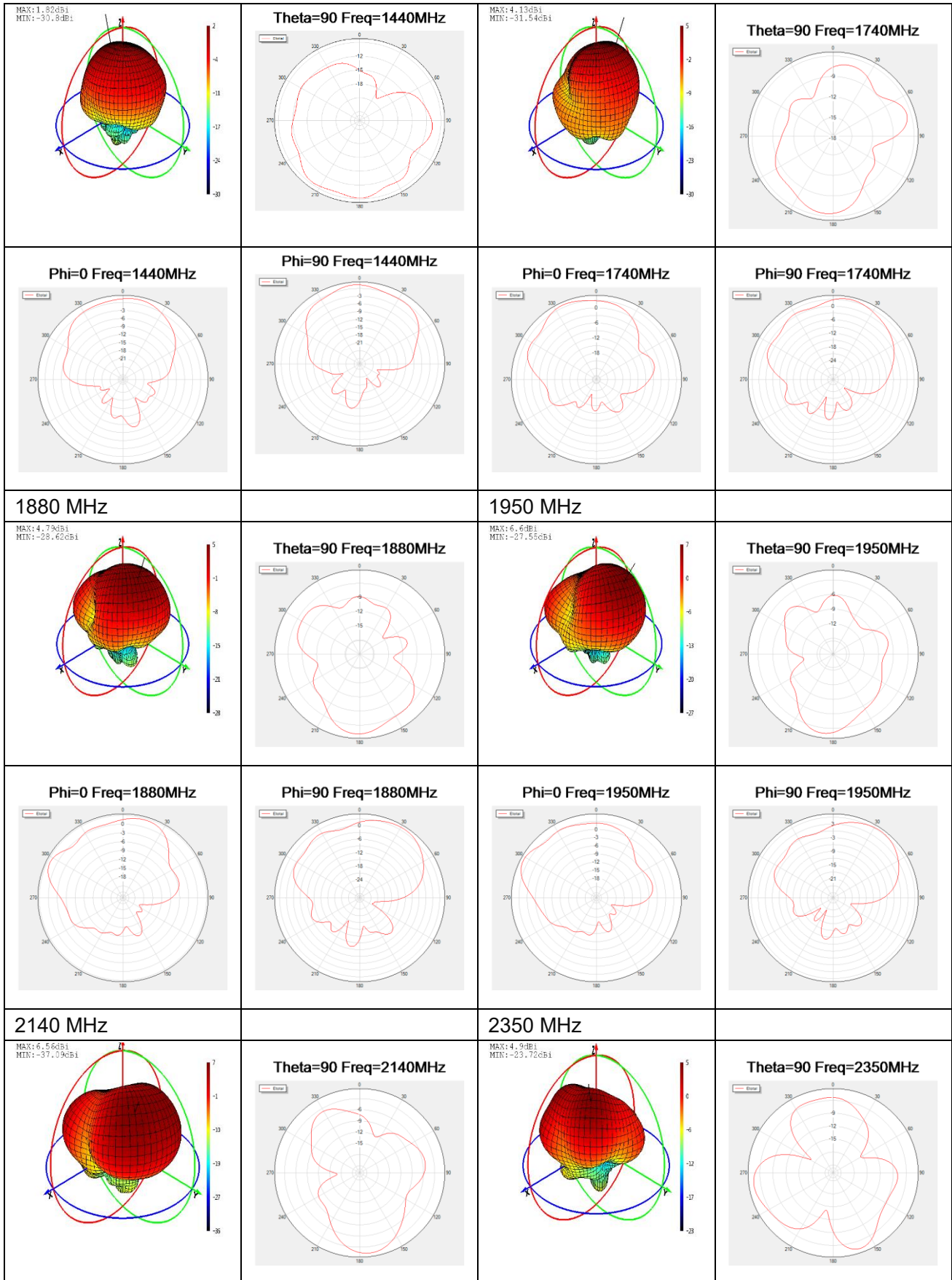


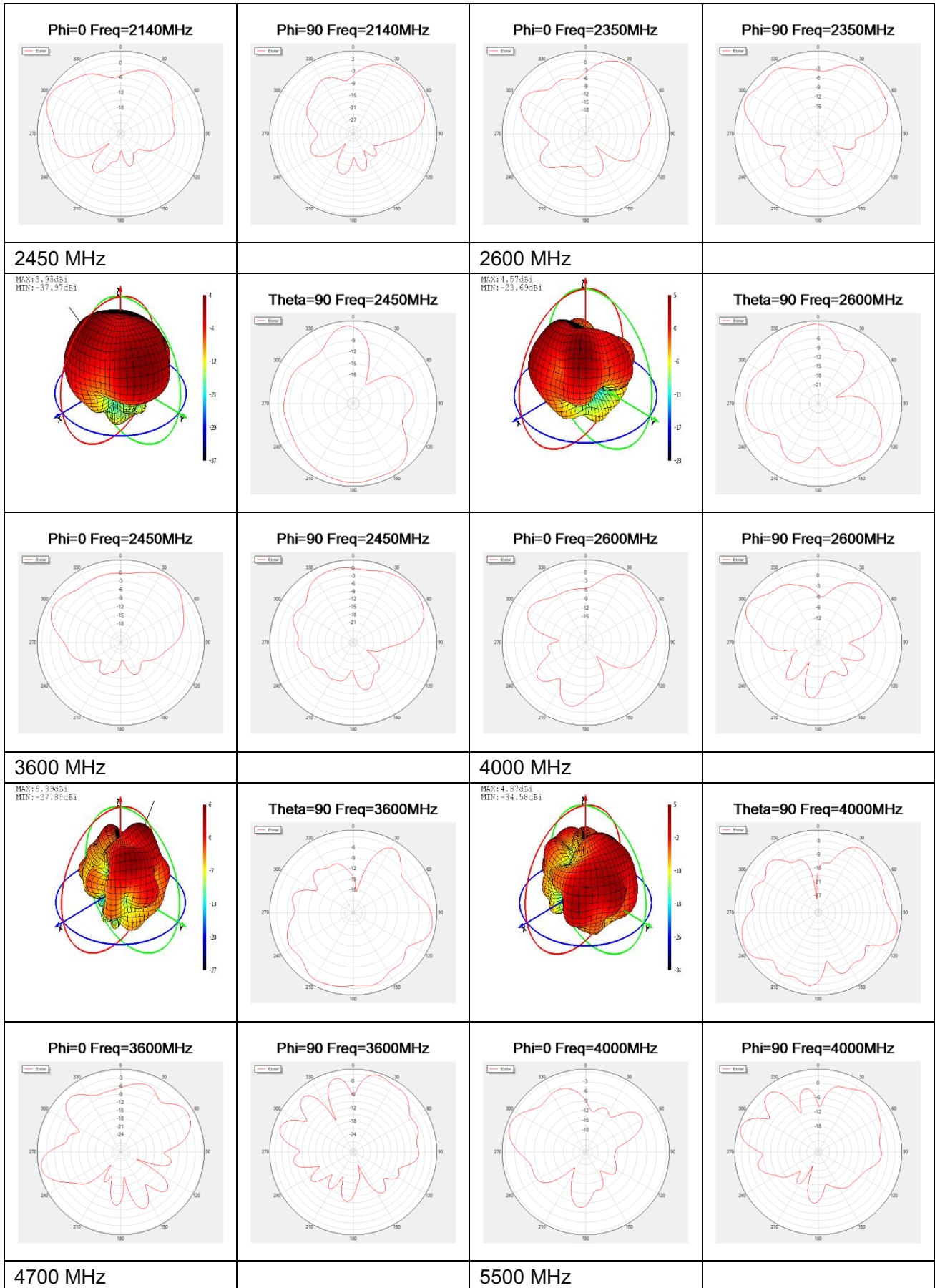


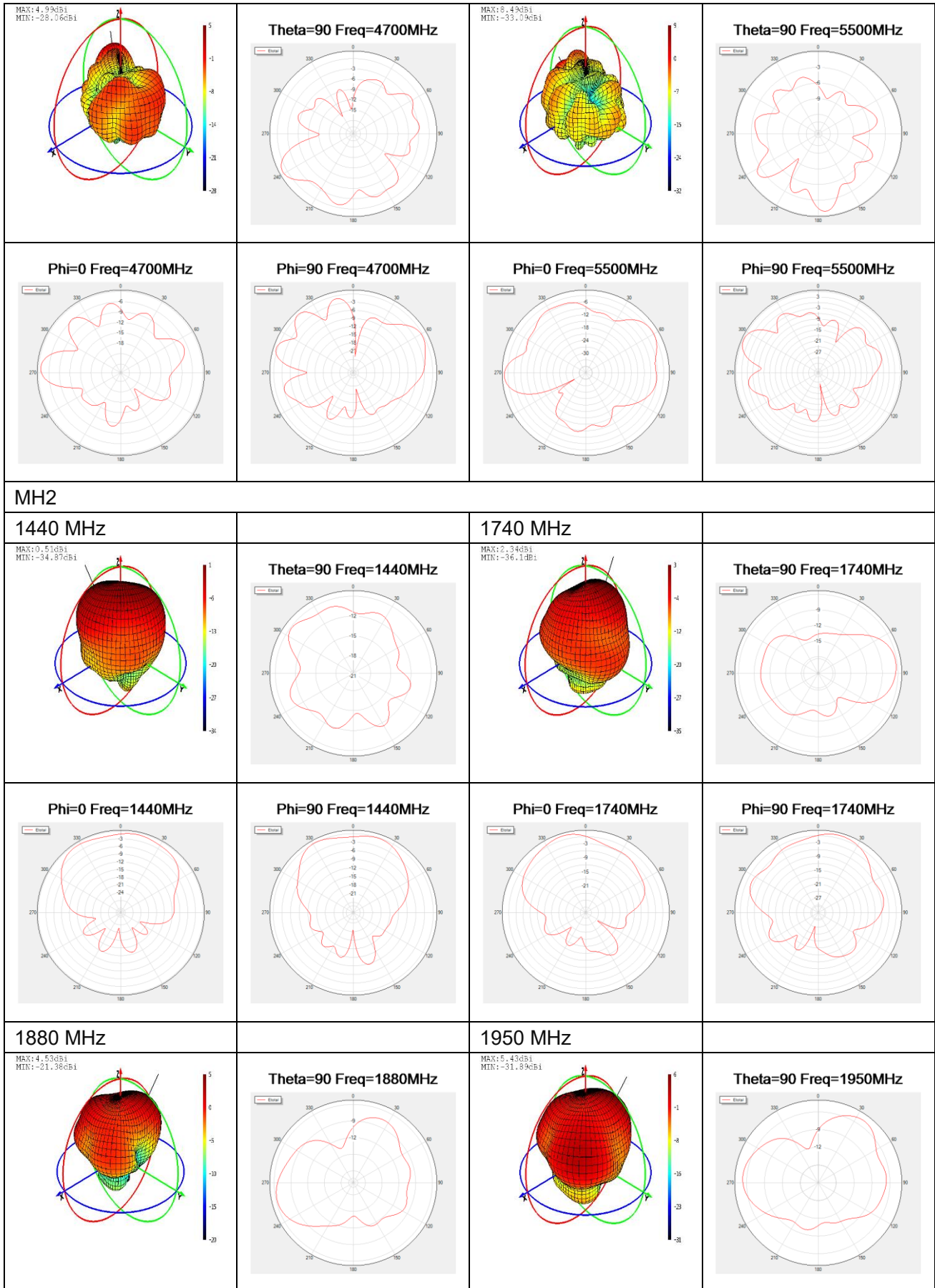


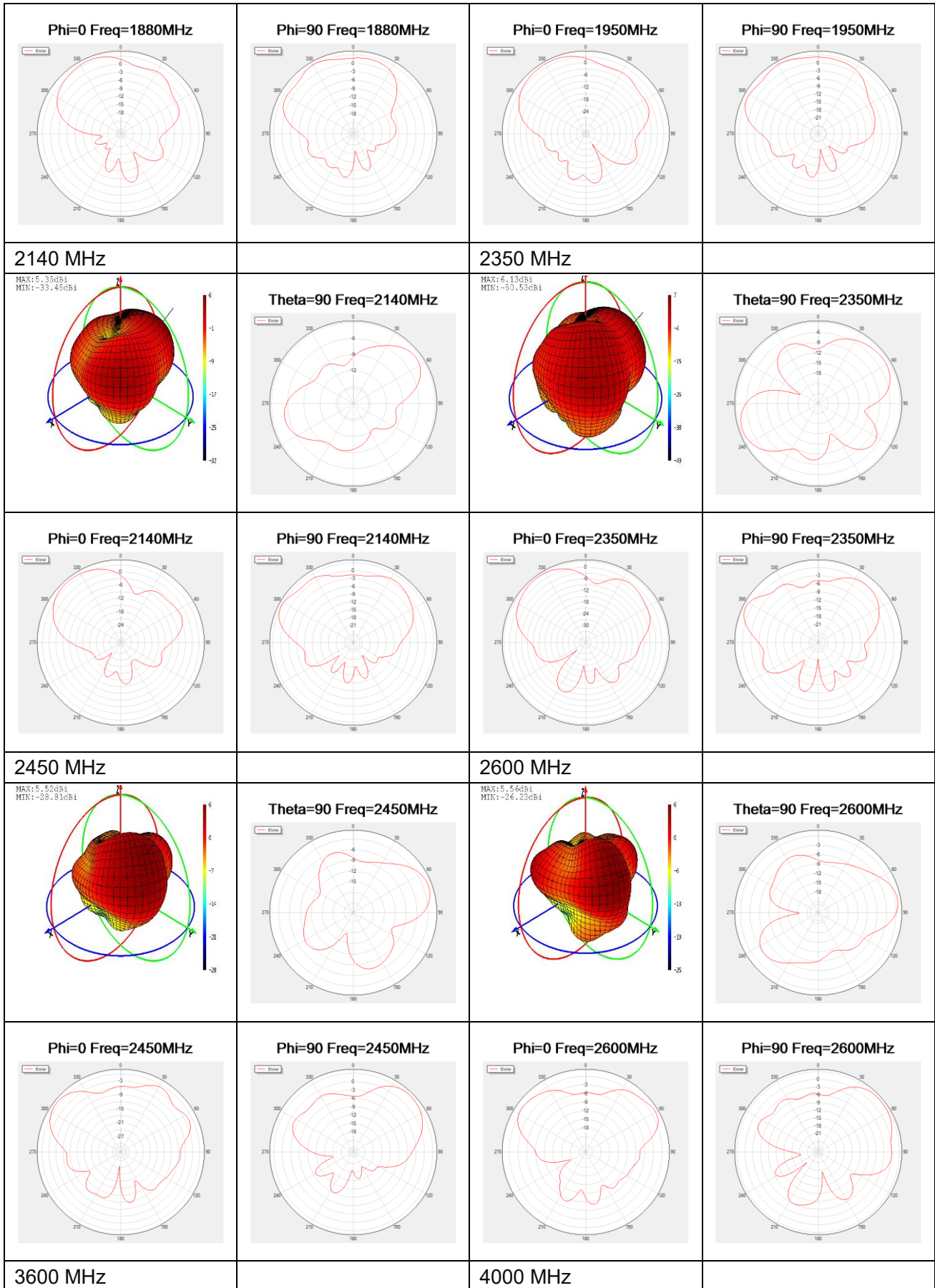


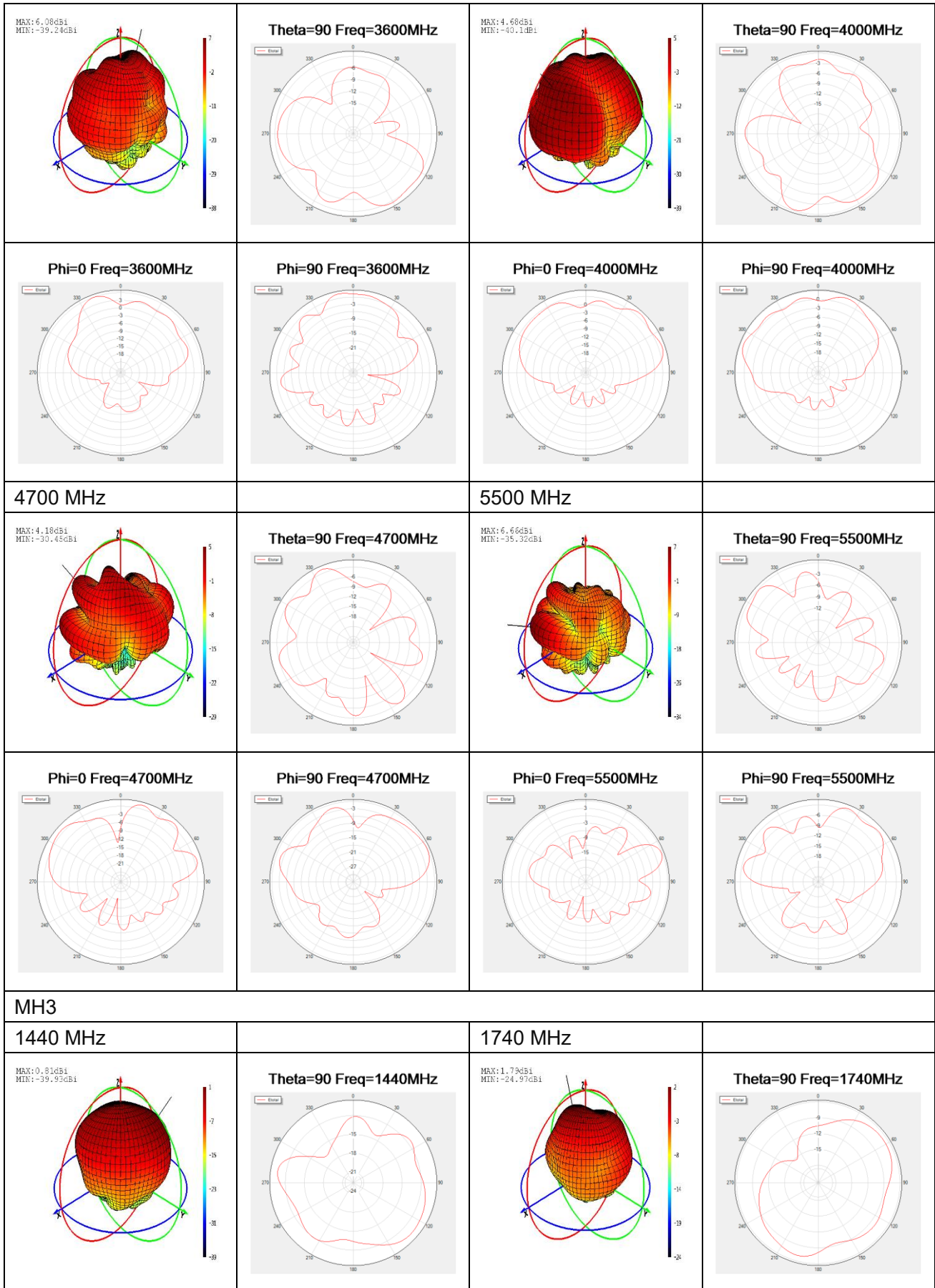


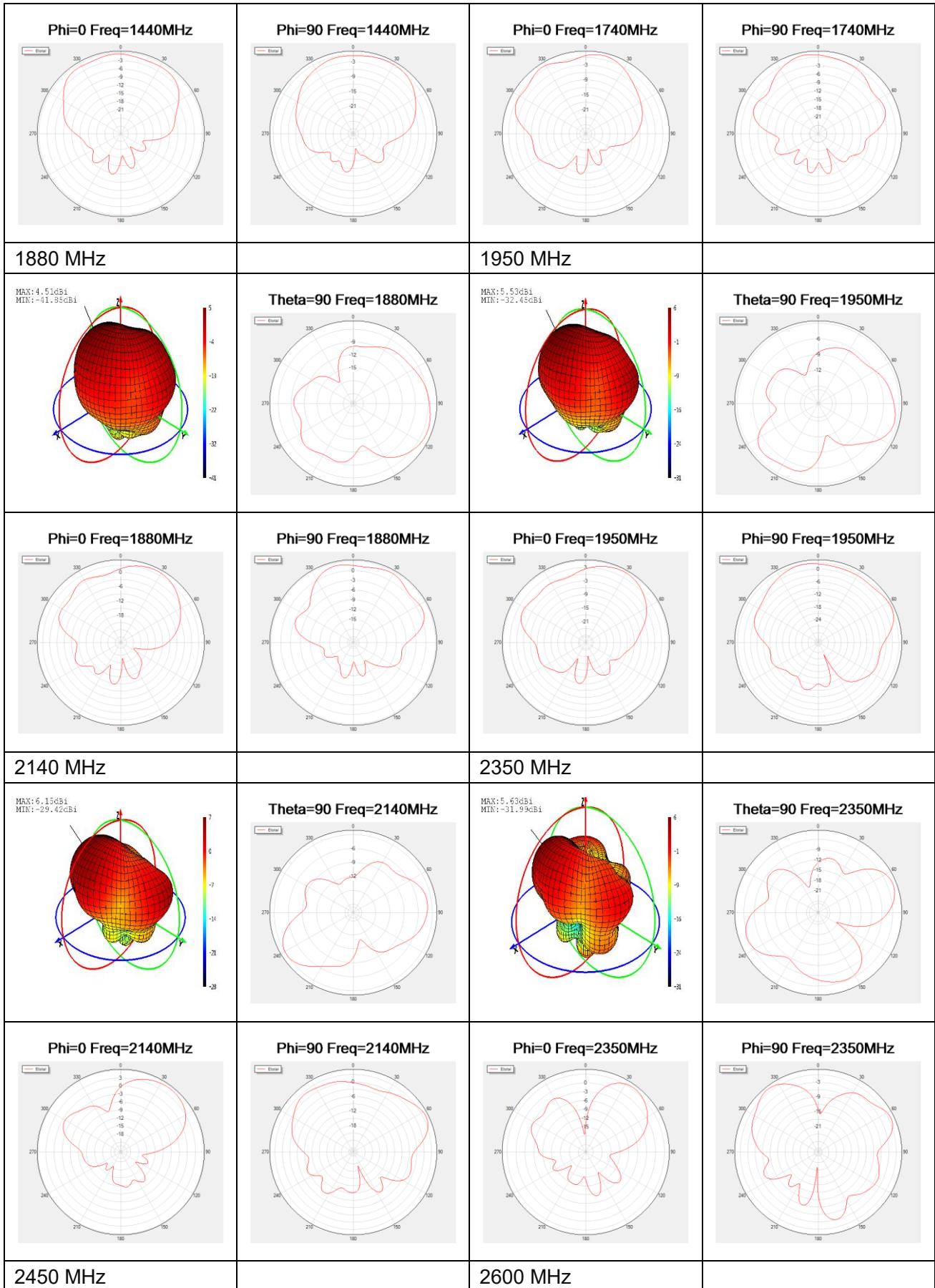


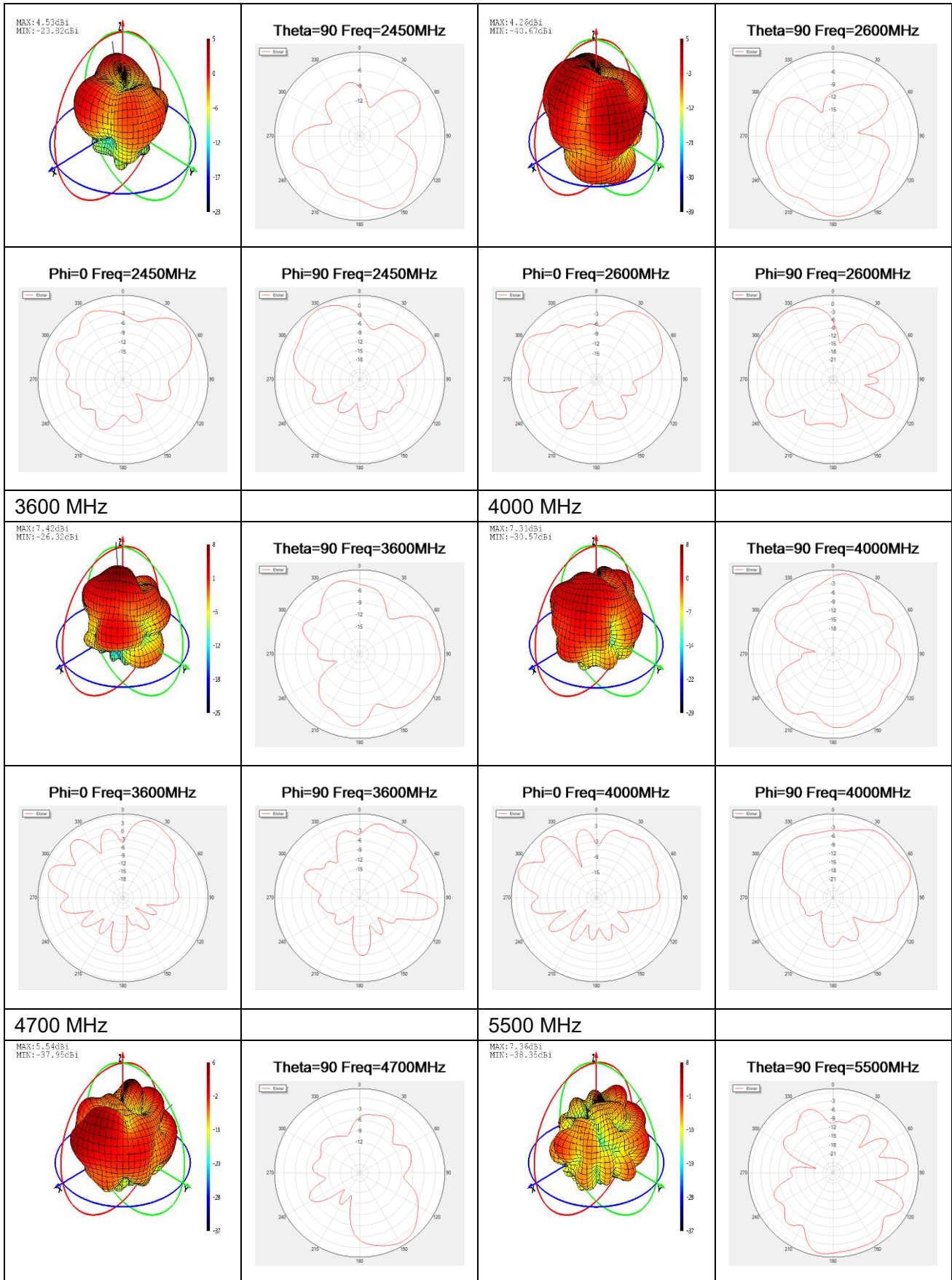


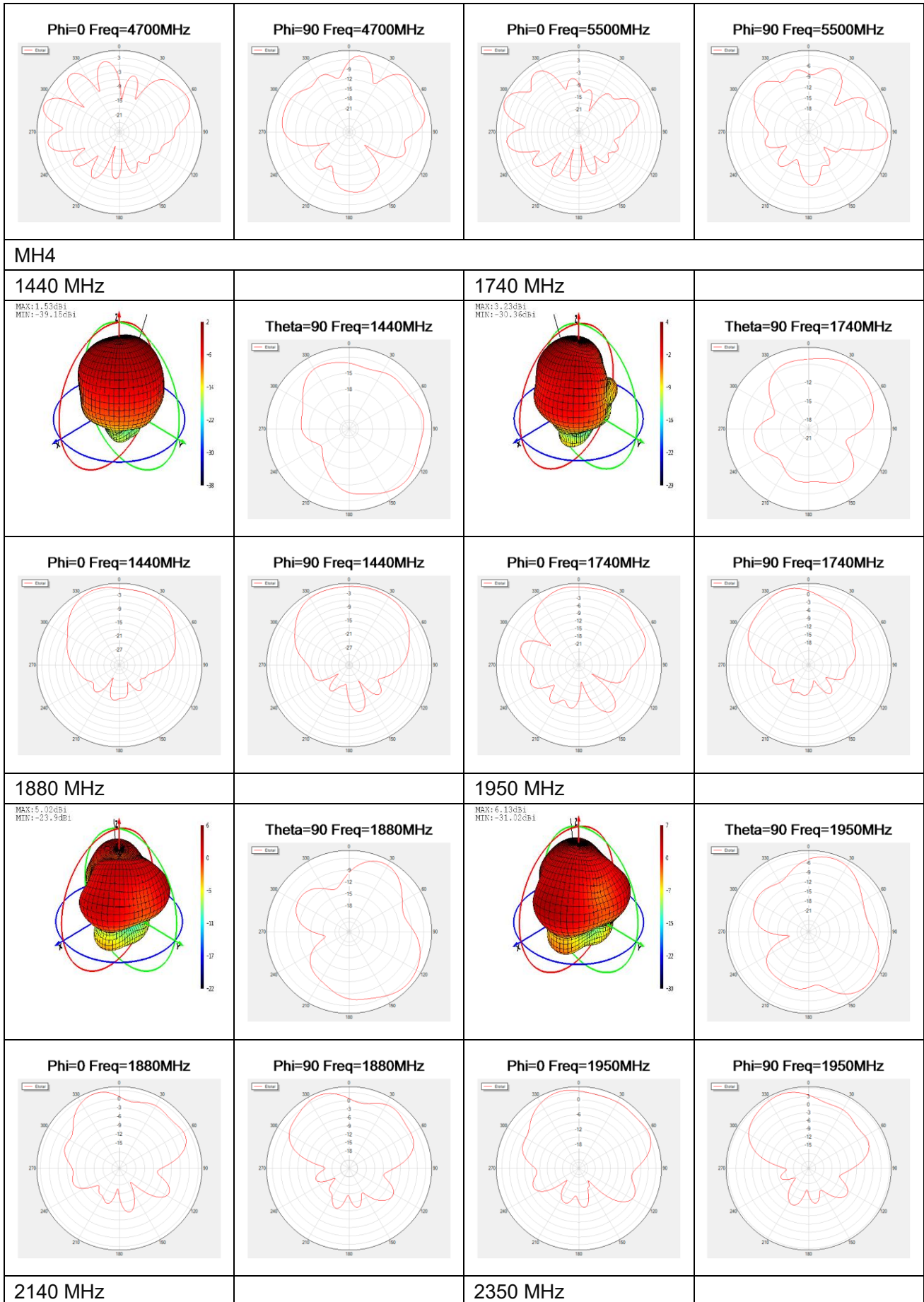


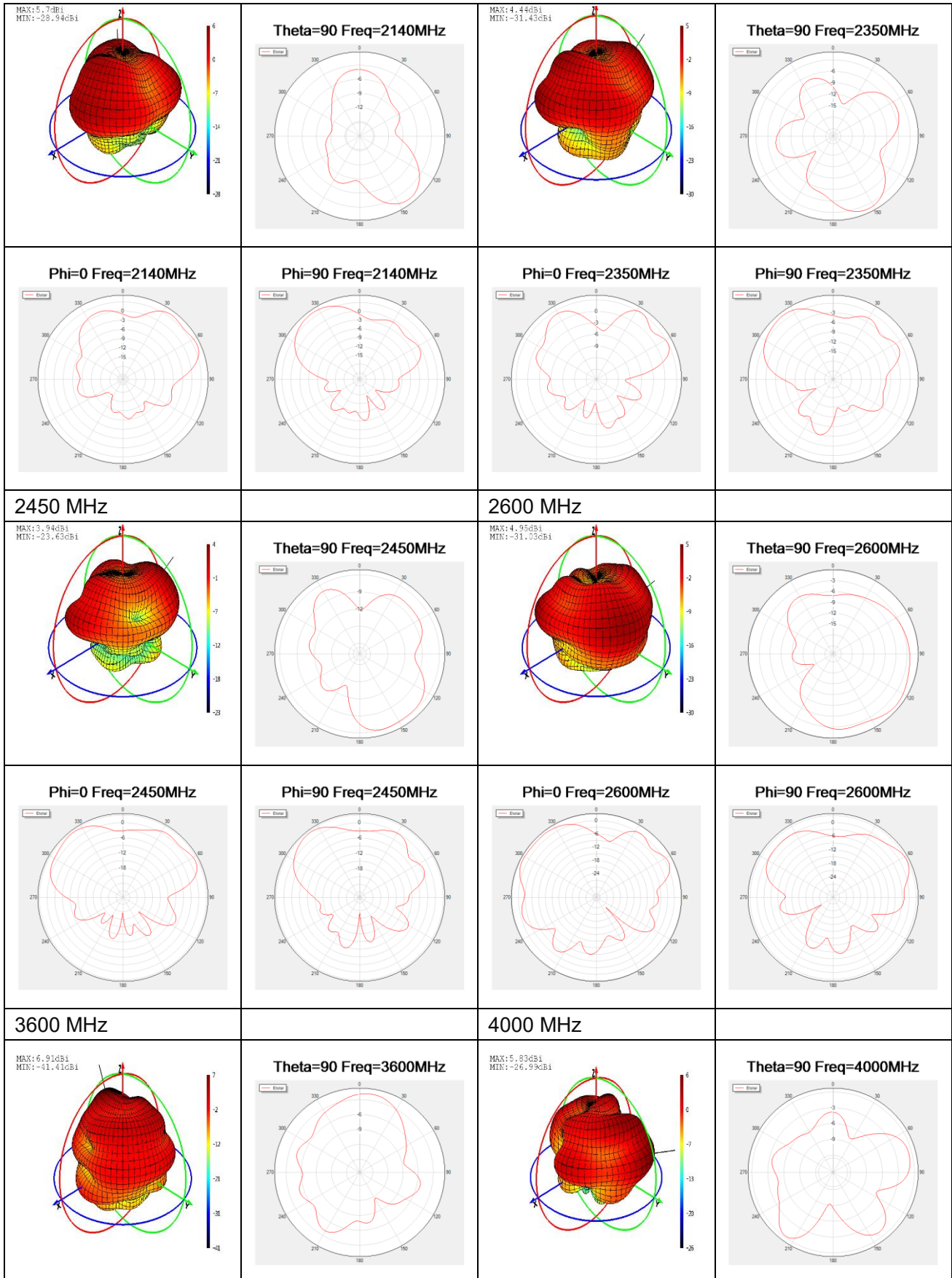


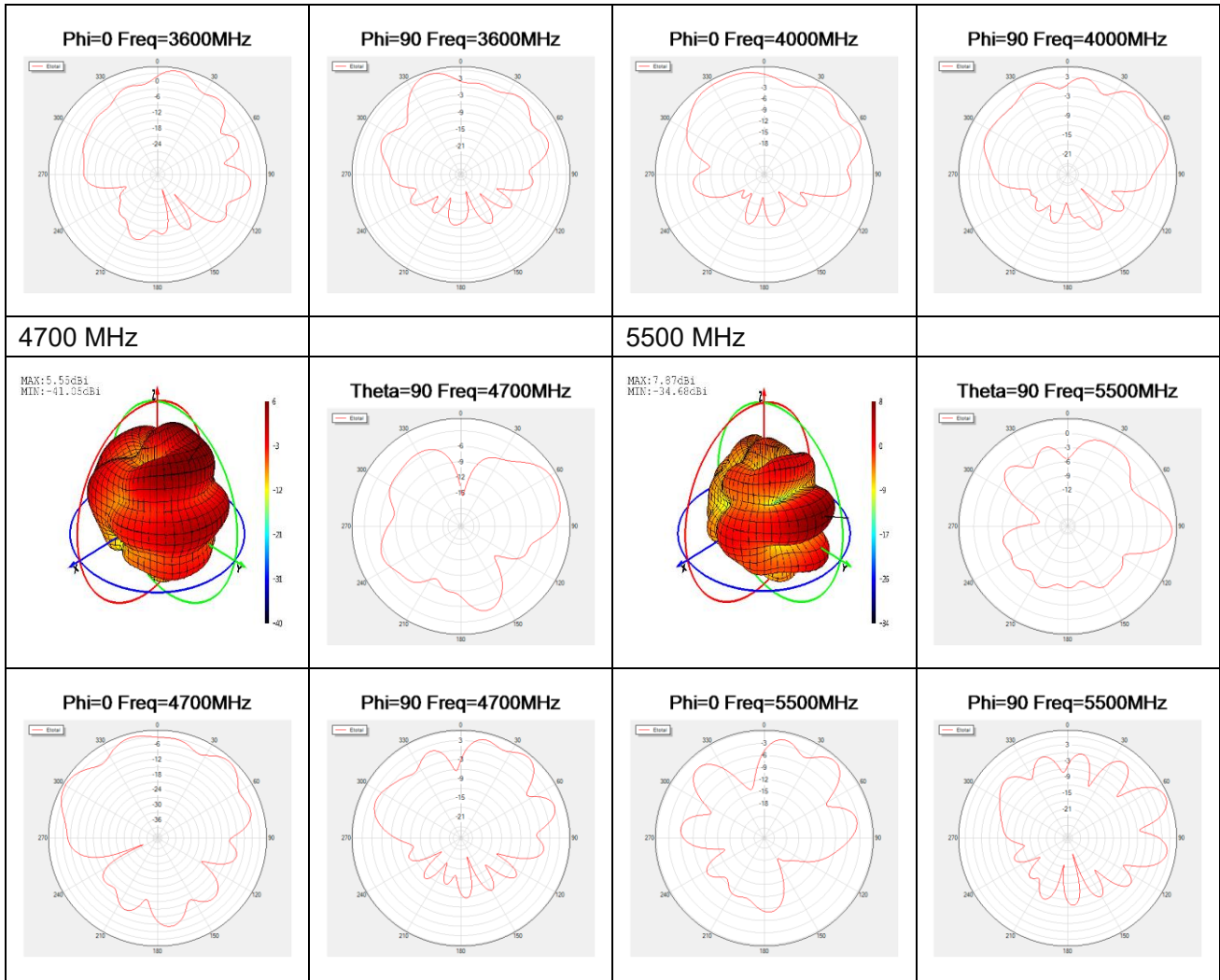












3.3 Active OTA Test

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

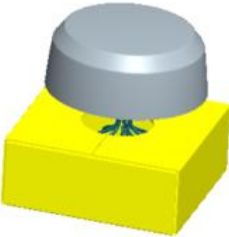

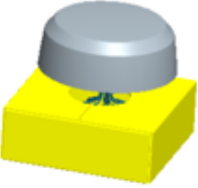

Band		Channel	TRP (dBm)	Channel	TIS (dBm)
LTE	B1 (10M)	18050	20.2	50	-102.7
		18350	19.9	350	-101.7
		18550	19.6	550	-102.1
	B2 (10M)	18650	19.0	650	-101.4
		18900	19.6	900	-101.8
		19150	19.8	1150	-101.4
	B3 (10M)	19250	21.1	1250	-100.4
		19575	20.1	1575	-100.9
		19900	20.7	1900	-100.1
	B4 (10M)	20000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

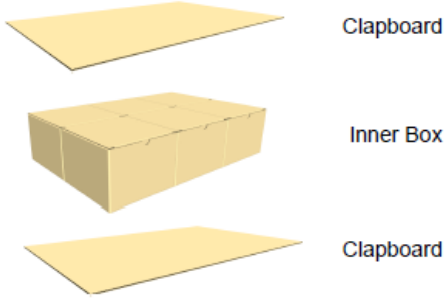
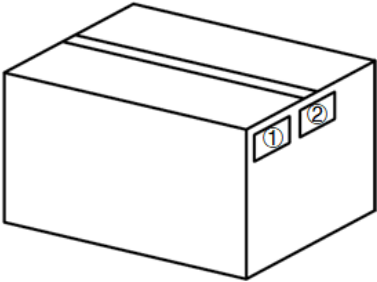
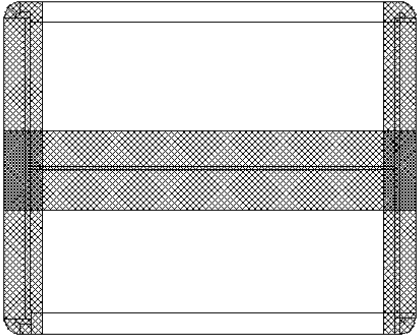
Band	Channel	TRP (dBm)	Channel	TIS (dBm)
B12 (5M)	23035	19.0	5035	-98.5
	23095	19.2	5095	-97.3
	23155	19.9	5155	-96.1
B13 (10M)	-	-	-	-
	23230	19.3	5230	-96.2
	-	-	-	-
B14 (10M)	-	-	-	-
	23330	19.0	5330	-95.0
	-	-	-	-
B17 (10M)	23780	18.4	5780	-95.9
	23790	18.6	5790	-95.7
	23800	18.6	5800	-95.3
B18 (10M)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

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

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

4 Packaging

Step	Packaging picture / 2D picture	Description
1	 <p>Lined with cardboard</p>	<p>1 PCS: Antenna 1 PCS: Lined with Cardboard Size: 185mm*185*60mm</p> <p>Arrange the antenna and put it in the lined cardboard</p>
2	 <p>EPE Pearl Foam</p>  <p>Lined with cardboard</p>	<p>1 PCS : EPE Pearl Foam Size: 186mm*186mm*40mm</p> <p>After placing the product, use EPE Pearl Foam on the upper layer</p>
3	 <p>Inner Box</p>	<p>1 PCS : Inner Box Size: 191mm*191mm*135mm</p> <p>Place the antenna and lining cardboard in Inner Box</p>

<p>4</p>		<p>1 PCS : Carton Size: 600mm*404mm*164mm Antenna : 6 PCS/Carton 2 PCS : Clapboard Size: 588mm*392mm Place 1 Clapboard on the bottom Then 6 pcs Antenna in the middle Then 1 pcs Clapboard on the top</p>
<p>5</p>		<p>Position for Attaching Labels--- ① Carton Label ② Quality Label</p>
<p>6</p>		<p>Sealing Cartons--- “I” type sealing cartons</p>

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:

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Revision History

Version	Date	Author	Note
-	2023-05-29	Mordecai Liu Hart Hu David Liu Vinnie Liu	Creation of the document
1.0	2023-05-29	Mordecai Liu Hart Hu David Liu Vinnie Liu	First official release

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