



# Antenna Datasheet

**Product OC:** YEMD301L1A

**Version:** 1.1

**Date:** 2024-11-07

**Status:** Released

**Product Name:** 4G & GNSS 3in1 Magnet & Adhesive & Screw Mount  
Combo Antenna

**Key Features:**

Frequency Band: 4G: 700–960 MHz, 1710–2690 MHz;

GNSS: 1559–1606 MHz

Dimensions: 109.28 mm × 89 mm × 25.8 mm

Efficiency: Up to 74 %

GNSS LNA Gain: 18 ±3 dB

RoHS & REACH & POPS Compliant

IP67

# Overview

YEMD301L1A is a 4G & GNSS 3in1 combo antenna measuring 109.28 × 89 × 25.8 mm. This ultra-wide-band 4G & GNSS antenna provides broad coverage from 1559–1606 MHz, 700–960 MHz, 1710–2690 MHz whilst offering backward-compatibility to support 3G and 2G networks as well as LTE Cat-M and narrowband IoT (NB-IoT). Ideal for applications where the antenna is required to be discrete, the antenna is available magnet & adhesive & screw mount omni-directional antenna. It is easy to install with maximum durability assured and suitable for use in harsh outdoor environments thanks to its IP67 rated, UV-resistant and UL 94 V-0 Flame Rating enclosure. It is compatible with Quectel's RM520x Series modules.

YEMD301L1A has 2 × 4G LMH antennas and 1 × GNSS L1 antenna. It allows high efficiency, stable signal transmission and reception for active GNSS from 1559–1606 MHz, and 4G bands from 700–960 MHz, 1710–2690 MHz. In the meantime, this product also offers high isolation between antennas to avoid self-interference. All in all, this unique product is designed to provide stable and high-speed data connection to 4G & GNSS applications. YEMD301L1A can be used in harsh environments thanks to its robust UV resistant (UL 746c f1) and flame resistant (UL 94 V-0) enclosure.

Typical applications include:

- Public safety
- HD Video Streaming
- Utilities and Smart Cities
- Fleet Management
- Automotive vehicle tracking

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

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# 1 Specification

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

## 1.1. Electrical

Electrical Specifications			
Frequency Range	LTE-1	700–960 MHz, 1710–2690 MHz	
	LTE-2	700–960 MHz, 1710–2690 MHz	
	GNSS	1559–1606 MHz	
Radiation Pattern	LTE-1	Omni-directional	
	LTE-2	Omni-directional	
	GNSS	Directional	
Polarization	LTE-1	Linear	
	LTE-2	Linear	
	GNSS	RHCP	
Impedance		50 Ω	
Isolation	LTE-1-LTE-2	FS	≤ -13.5 dB
		MP	≤ -15.5 dB
	LTE-1-GNSS	FS	≤ -46.7 dB
		MP	≤ -45.2 dB
	LTE-2-GNSS	FS	≤ -47.9 dB
		MP	≤ -50.1 dB

### 1.1.1. LTE-1

Electrical – Detail												
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	2.3	2.3	3.7	-	1.4	2.1	2.5	3.1	-	-	-
	MP	2.1	2.2	5.6	-	1.8	2.1	2.2	2.5	-	-	-
Max. Return Loss (dB)	FS	-8.1	-8.1	-4.9	-	-14.8	-9.2	-7.3	-5.9	-	-	-
	MP	-8.9	-8.4	-3.1	-	-10.9	-9.1	-8.6	-7.4	-	-	-
AVG Eff. (%)	FS	56.1	65.3	54.7	-	65.2	49.6	38.9	35.1	-	-	-
	MP	69.8	50.0	51.8	-	51.9	39.9	39.2	45.4	-	-	-
AVG AVG Gain (dB)	FS	-2.5	-1.9	-2.6	-	-1.9	-3.0	-4.1	-4.5	-	-	-
	MP	-1.6	-3.0	-2.9	-	-2.8	-4.0	-4.1	-3.4	-	-	-
Max. Peak Gain (dBi)	FS	1.8	3.1	3.1	-	5.5	3.7	2.7	1.6	-	-	-
	MP	3.4	3.4	3.0	-	3.3	1.9	3.1	3.3	-	-	-
VSWR	FS						≤3.7					
	MP						≤5.6					
Return Loss	FS						≤-4.9 dB					
	MP						≤-3.1 dB					
Gain	FS						≤5.5 dBi					
	MP						≤3.4 dBi					

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

## 1.1.2. LTE-2

Electrical – Detail													
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	2.4	2.4	4.7	-	1.4	2.1	2.7	3.0	-	-	-	
	MP	2.3	2.4	6.0	-	2.1	1.9	2.0	2.4	-	-	-	
Max. Return Loss (dB)	FS	-7.6	-7.6	-3.8	-	-15.3	-8.8	-6.8	-6.1	-	-	-	
	MP	-8.0	-7.6	-2.9	-	-9.2	-10.2	-9.3	-7.6	-	-	-	
AVG Eff. (%)	FS	52.6	67.2	56.6	-	63.8	49.5	35.8	31.4	-	-	-	
	MP	54.1	54.5	36.0	-	53.0	41.5	35.8	38.1	-	-	-	
AVG AVG Gain (dB)	FS	-2.8	-1.7	-2.5	-	-2.0	-3.1	-4.5	-5.0	-	-	-	
	MP	-2.7	-2.6	-4.4	-	-2.8	-3.8	-4.5	-4.2	-	-	-	
Max. Peak Gain (dBi)	FS	0.4	3.0	2.2	-	4.3	1.6	0.7	0.2	-	-	-	
	MP	2.7	2.7	2.0	-	6.0	2.0	4.3	4.8	-	-	-	
VSWR	FS						≤4.7						
	MP						≤6.0						
Return Loss	FS						≤-3.8 dB						
	MP						≤-2.9 dB						
Gain	FS						≤4.3 dBi						
	MP						≤6.0 dBi						

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

### 1.1.3. GNSS

Band Frequency (MHz)	GPS L5 GALILEO E5a BDS B2a- B2I QZSS L5 IRNSS L5	GALILEO E5b BDS B2b	GPS L2 QZSS L2C	GLONASS G2	BDS B3	BDS B1I	GPS L1 GALILEO E1 BDS B1C QZSS L1	GLONASS G1
	1176	1207	1227	1248	1268	1561	1575	1602
<b>VSWR</b>	-	-	-	-	-	4.73	1.63	1.54
<b>Return Loss (dB)</b>	-	-	-	-	-	-3.7	-12.3	-13.2
<b>Efficiency (%)</b>	-	-	-	-	-	42	79	76
<b>Peak Gain (dBi)</b>	-	-	-	-	-	-0.91	1.95	2.18

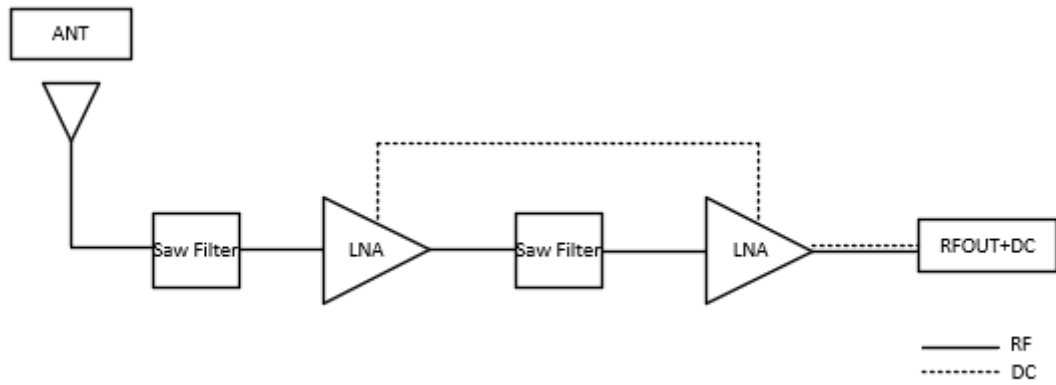
LNA Electrical	
<b>LNA Gain</b>	18 ±3 dB
<b>Noise Figure</b>	≤ 2.5 dB
<b>Output VSWR</b>	< 2.0
<b>Input VSWR</b>	< 2.0
<b>Filter Out-of-Band Attenuation</b>	60 dB f0 ±100 MHz f0 (1580 MHz)
<b>Working Voltage</b>	2.7–3.3 V
<b>Working Current</b>	8.3 ±1.5 mA @ 3 V
<b>Impedance</b>	50 Ω

## 1.2. Mechanical & Storage

Mechanical		
<b>Antenna Dimensions</b>		109.28 mm × 89 mm × 25.8 mm
<b>Antenna Material &amp; Color</b>		PC & Black
<b>Cable Type &amp; Color &amp; Length</b>	<b>LTE-1</b>	ALS302 & Black & 1025 ±25 mm
	<b>LTE-2</b>	ALS302 & Black & 1025 ±25 mm
	<b>GNSS</b>	RG174 & Black & 1025 ±25 mm
<b>Connector Type</b>	<b>LTE-1</b>	SMA Male (The current state of the SMA connector is not waterproof. If a waterproof connector is required, it can be customized.)
	<b>LTE-2</b>	SMA Male (The current state of the SMA connector is not waterproof. If a waterproof connector is required, it can be customized.)
	<b>GNSS</b>	SMA Male (The current state of the SMA connector is not waterproof. If a waterproof connector is required, it can be customized.)
<b>Weight</b>		Typ. 145 g
<b>Mounting Type</b>		Magnet & Adhesive & Screw
Environmental		
<b>Storage Temperature</b>		-40 °C to +85 °C
<b>Operation Temperature</b>		-40 °C to +85 °C
<b>Ingress Protection (IP) Rating</b>		IP67
<b>RoHS &amp; REACH &amp; POPS Compliant</b>		Yes
<b>Housing Flame Rating</b>		UL 94 V-0
<b>Housing UV Resistant</b>		UL 746c f1



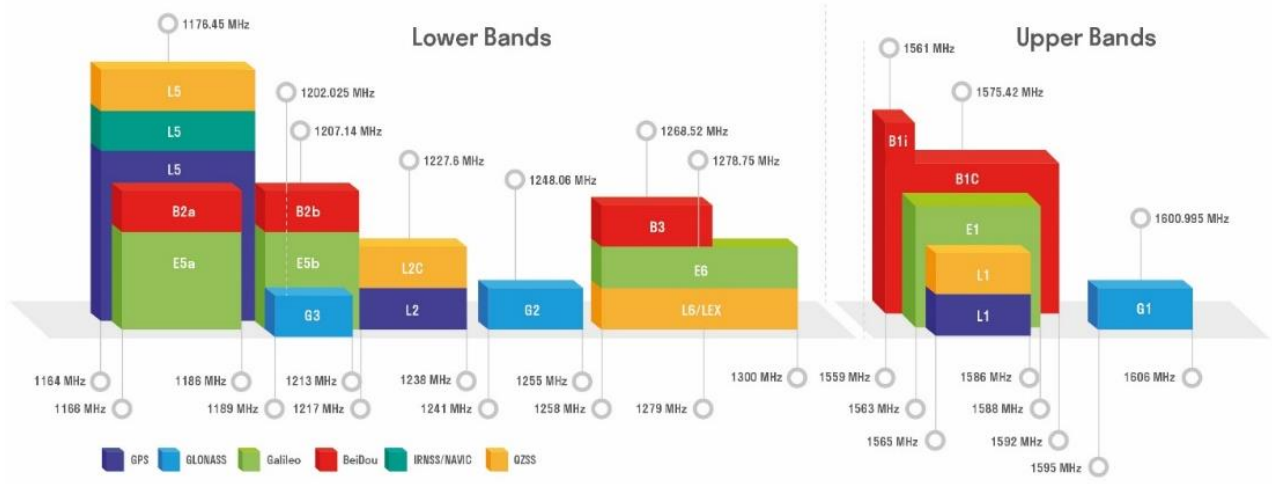
### 1.3. Block Diagram (Active Antenna)



## 1.4. Supported GNSS Frequency Bands

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

### GNSS Bands and Constellations

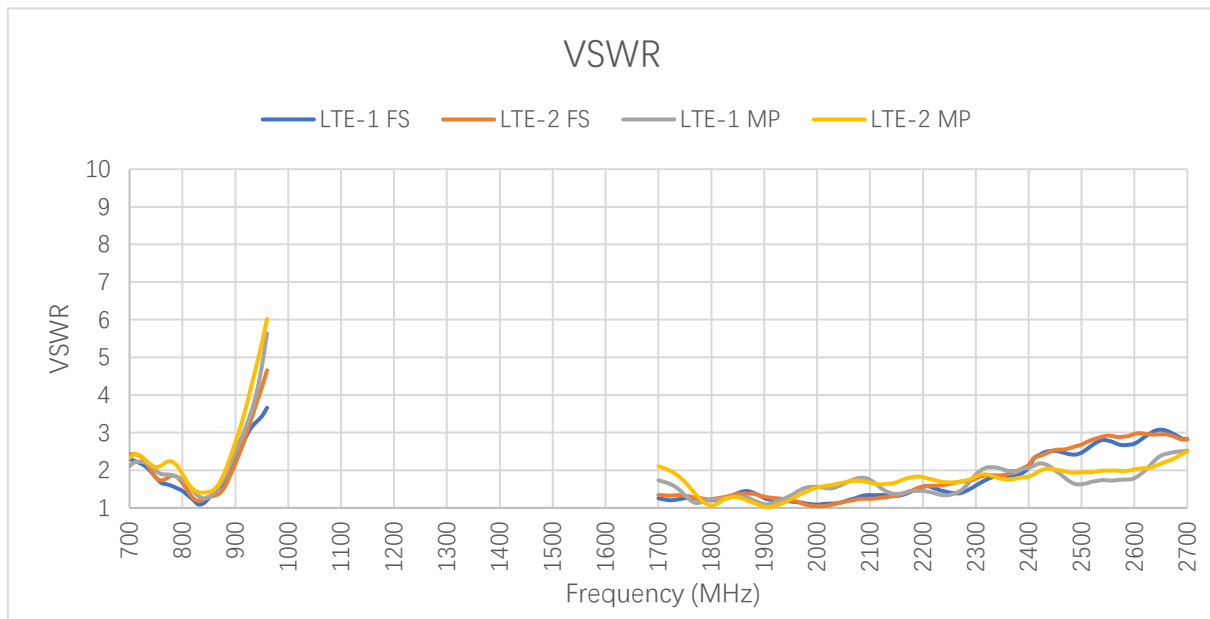




# 3 Detailed Performance

## 3.1. S-Parameter Test

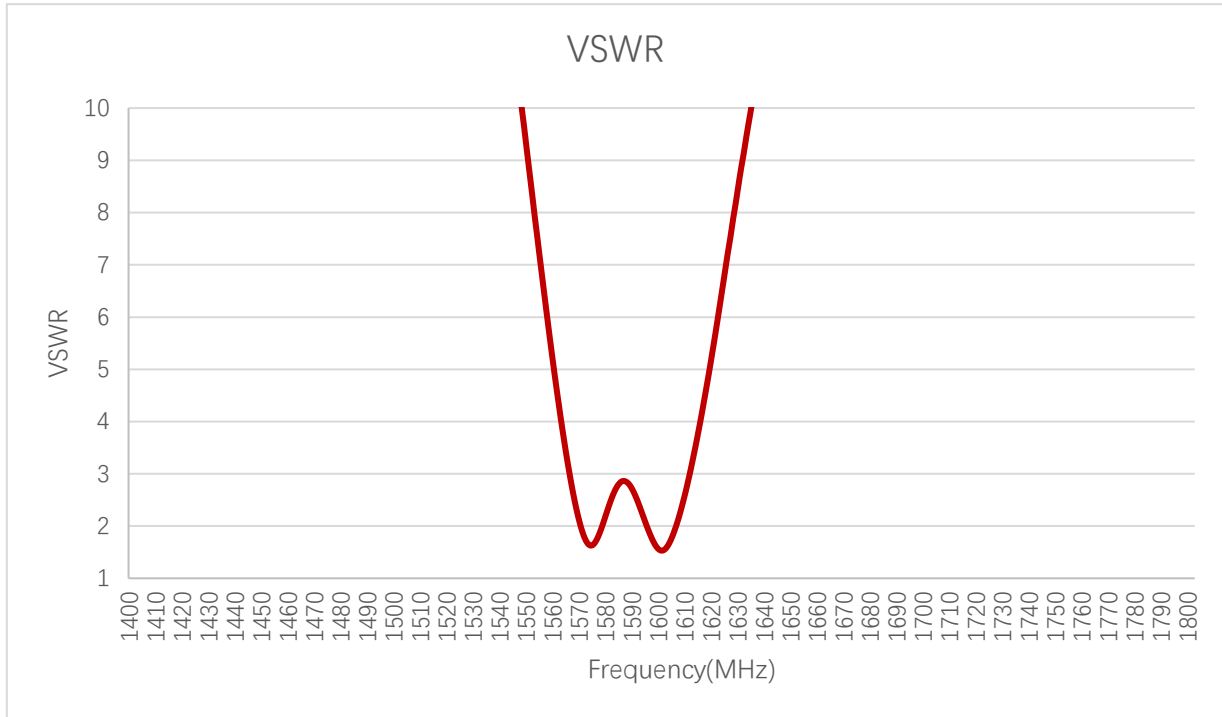
### 3.1.1. VSWR



**VSWR – LTE**

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LTE-1	FS	-	-	2.2	1.1	2.2	3.7	-	1.2	1.2	1.4
	MP	-	-	2.2	1.3	2.5	5.6	-	1.7	1.5	1.2
LTE-2	FS	-	-	2.4	1.2	2.2	4.7	-	1.3	1.3	1.4
	MP	-	-	2.4	1.4	2.7	6.0	-	2.1	1.8	1.1
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
LTE-1	FS	1.2	1.3	1.8	2.5	2.7	2.8	-	-	-	-
	MP	1.3	1.4	2.0	2.0	1.8	2.5	-	-	-	-

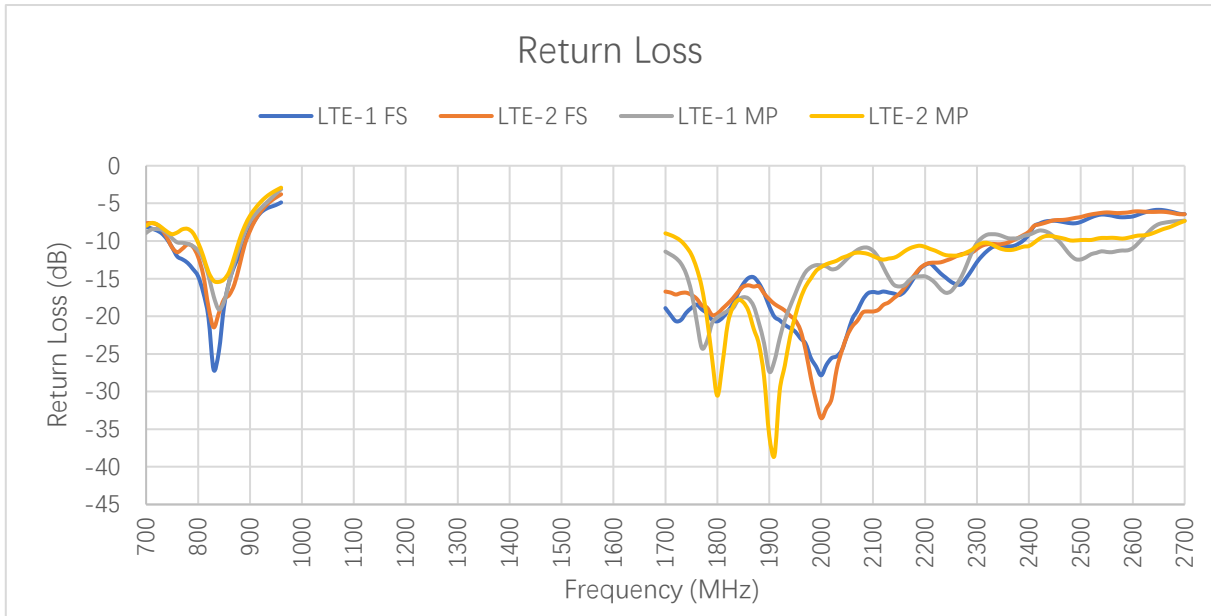
<b>LTE-2</b>	<b>FS</b>	1.2	1.3	1.9	2.5	3.0	2.8	-	-	-	-
	<b>MP</b>	1.2	1.6	1.8	2.0	2.0	2.4	-	-	-	-



**VSWR – GNSS**

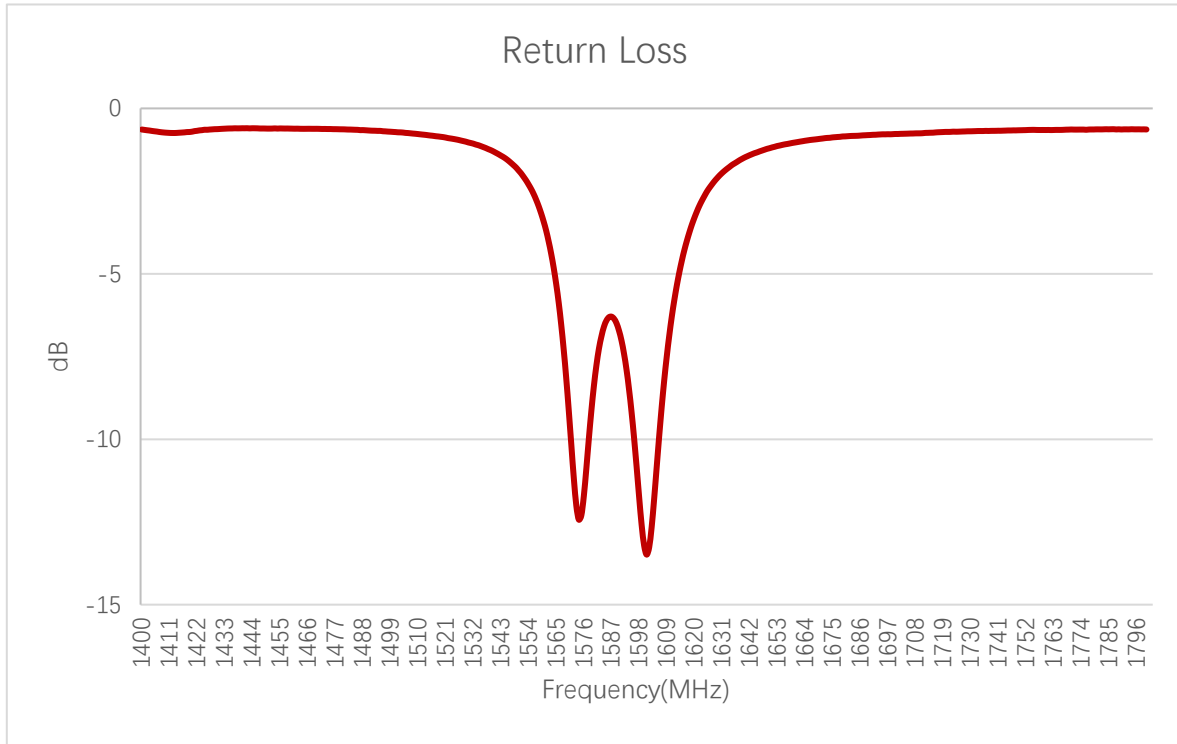
<b>Frequency (MHz)</b>	<b>1176</b>	<b>1207</b>	<b>1227</b>	<b>1248</b>	<b>1268</b>	<b>1561</b>	<b>1575</b>	<b>1602</b>
<b>VSWR</b>	-	-	-	-	-	4.73	1.63	1.54

**3.1.2. Return Loss**



**Return Loss (dB) – LTE**

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LTE-1	FS	-	-	-8.3	-27.1	-8.4	-4.9	-	-19.8	-19.5	-15.6
	MP	-	-	-8.5	-17.3	-7.4	-3.1	-	-11.8	-14.4	-20.9
LTE-2	FS	-	-	-7.6	-21.5	-8.7	-3.8	-	-16.9	-16.9	-16.0
	MP	-	-	-7.6	-15.3	-6.7	-2.9	-	-9.2	-10.8	-23.7
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
LTE-1	FS	-22.0	-17.0	-10.6	-7.3	-6.7	-6.4	-	-	-	-
	MP	-17.0	-15.8	-9.4	-9.6	-11.0	-7.4	-	-	-	-
LTE-2	FS	-20.5	-17.6	-10.4	-7.2	-6.1	-6.4	-	-	-	-
	MP	-20.0	-12.2	-11.1	-9.4	-9.4	-7.6	-	-	-	-

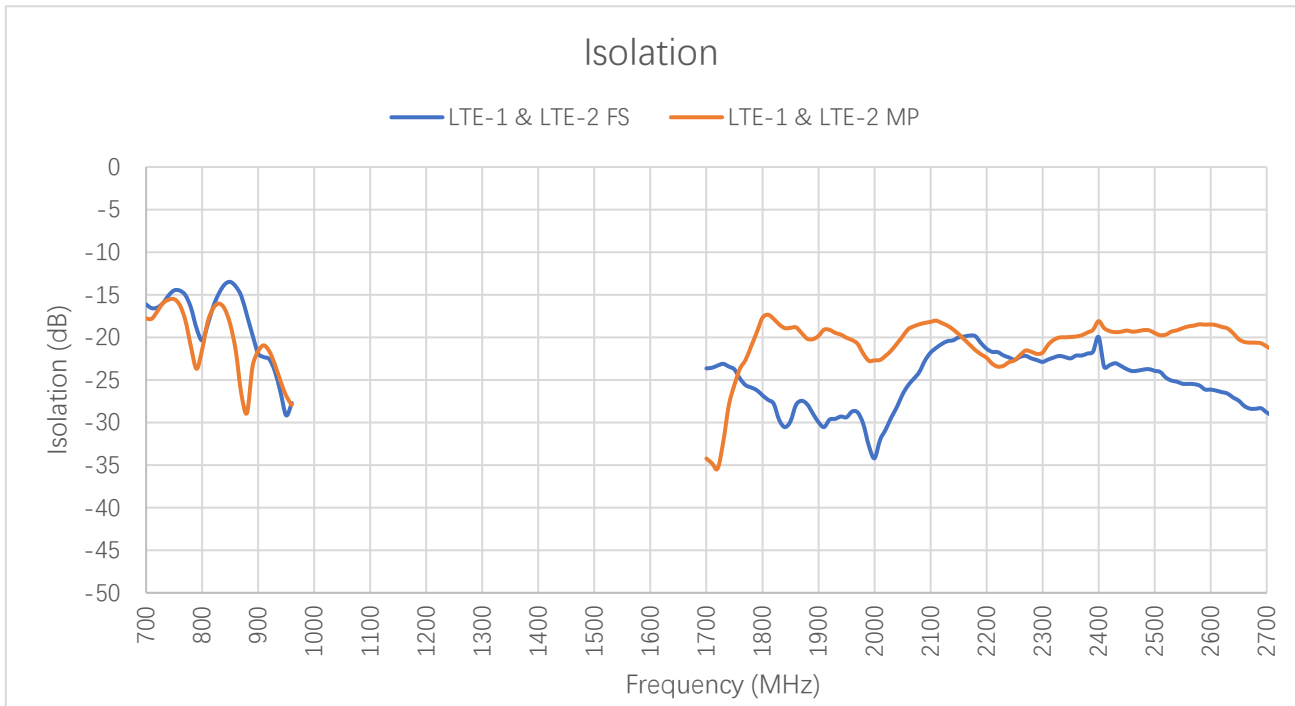


**Return Loss(dB) – GNSS**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Return Loss (dB)	-	-	-	-	-	-3.7	-12.3	-13.2

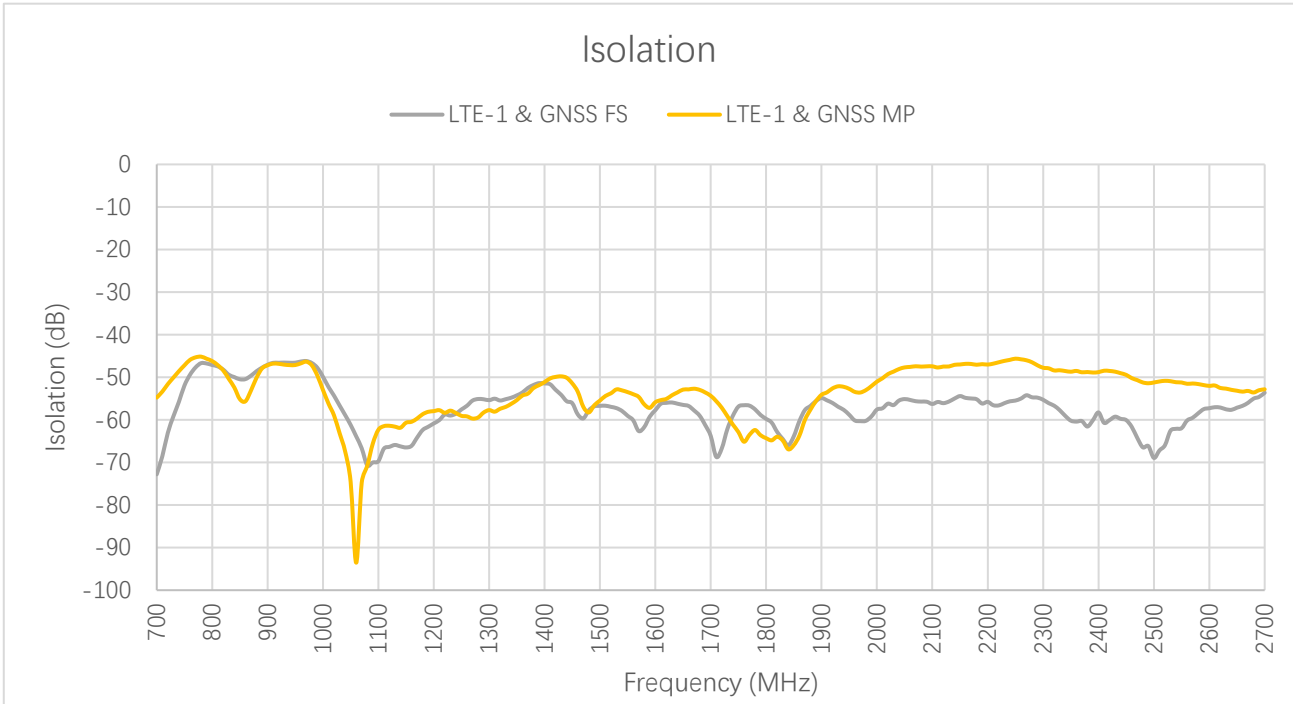


**3.1.3. Isolation**



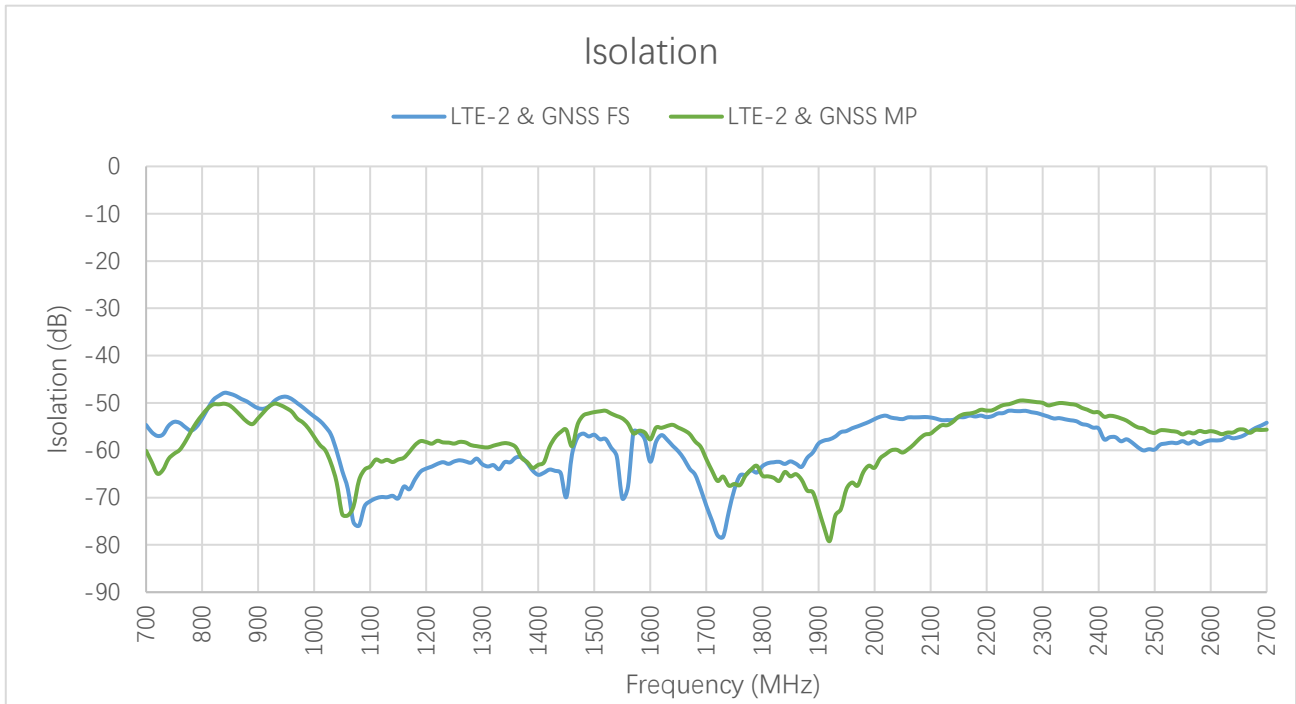
**Max Isolation (dB)**

Band	B71	B12/ B13/ B28	B5/ B8/ B26	n74/ n75/ n76	B1/ B2/ B3	B40	Wi-Fi 2G	B38/ B41	B42/ B48/ n77	BDS B1I	GPS L1	
Freq. (MHz)	600– 700	700– 810	820– 960	1420– 1520	1700– 2170	2300– 2400	2400– 2500	2500– 2690	3300– 4200	1559– 1564	1565– 1586	
LTE-1 & LTE-2	FS	-16.1	-14.5	-13.5	-	-19.8	-20.0	-20.0	-23.9	-	-	-
	MP	-17.8	-15.5	-16.0	-	-17.4	-18.1	-18.1	-18.5	-	-	-



**Max Isolation (dB)**

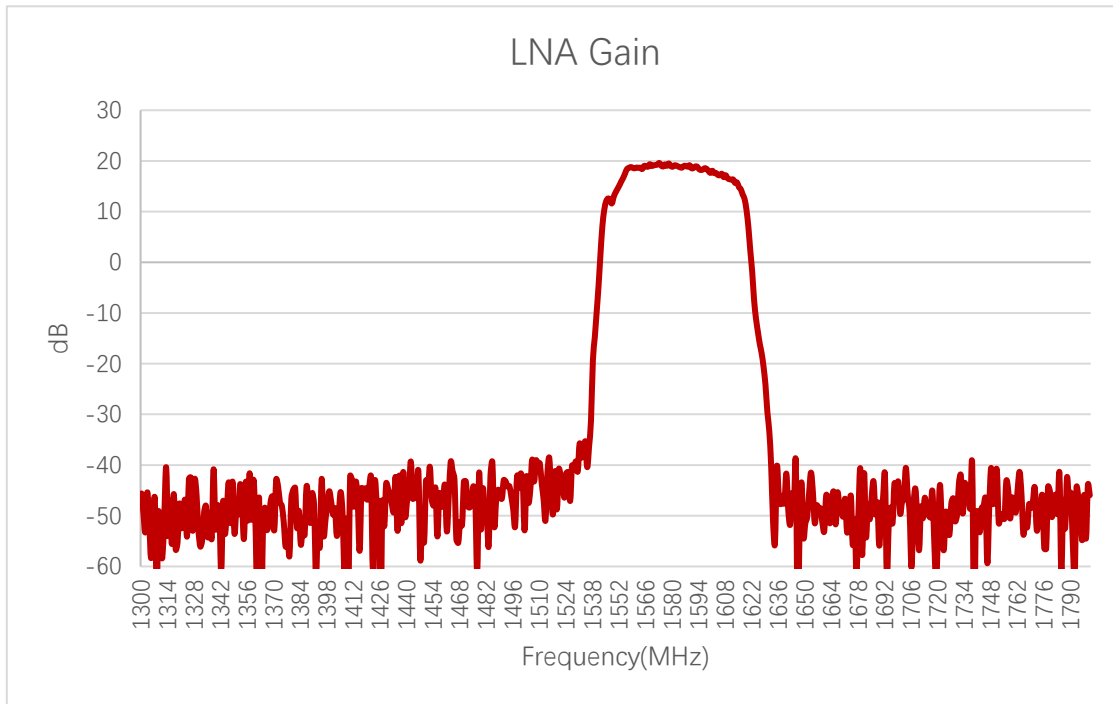
Band	B71	B12/ B13/ B28	B5/ B8/ B26	n74/ n75/ n76	B1/ B2/ B3	B40	Wi-Fi 2G	B38/ B41	B42/ B48/ n77	BDS B1I	GPS L1	
Freq. (MHz)	600– 700	700– 810	820– 960	1420– 1520	1700– 2170	2300– 2400	2400– 2500	2500– 2690	3300– 4200	1559– 1564	1565– 1586	
LTE-1 & GNSS	FS	-72.8	-46.7	-46.3	-	-54.4	-55.3	-58.3	-54.6	-	-60.1	-59.2
	MP	-54.8	-45.2	-46.7	-	-46.8	-47.8	-48.5	-50.8	-	-54.0	-54.0



**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	BDS B1I	GPS L1	
		Freq. (MHz)	600– 700	700– 810	820– 960	1420– 1520	1700– 2170	2300– 2400	2400– 2500	2500– 2690	3300– 4200	1559– 1564
LTE-2 & GNSS	FS	-54.6	-51.2	-47.9	-	-52.7	-52.5	-55.4	-54.8	-	-56.1	-56.1
	MP	-60.1	-51.1	-50.1	-	-52.2	-50.0	-52.0	-55.6	-	-54.4	-54.4

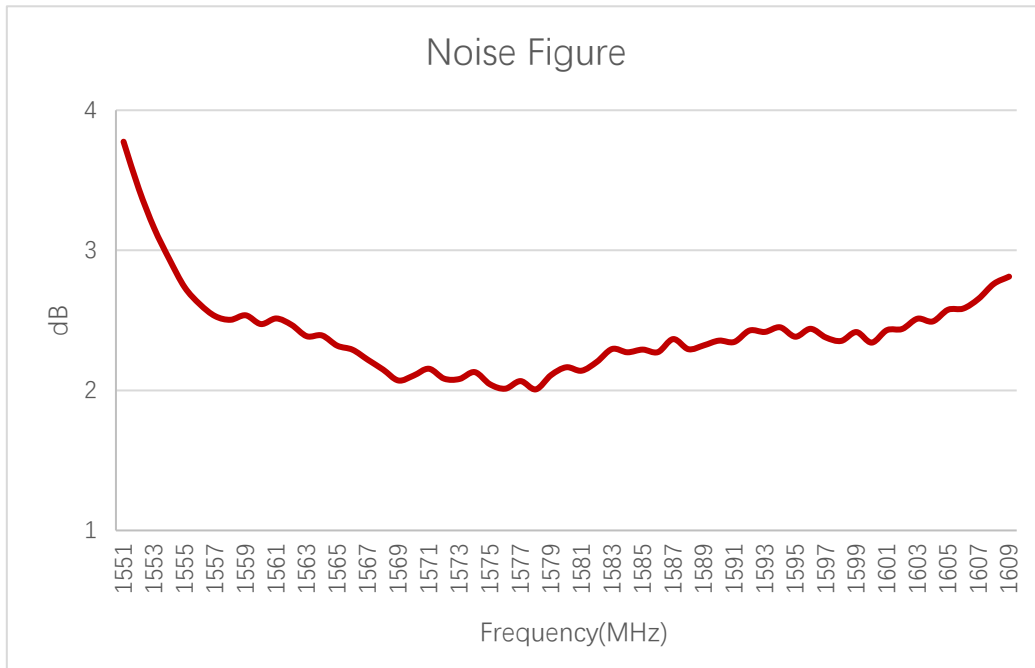
**3.1.4. GNSS LNA Gain**



**LNA Gain (dB)**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
LNA Gain (dB)	-	-	-	-	-	18.7	18.8	17.5

**3.1.5. GNSS Noise Figure**

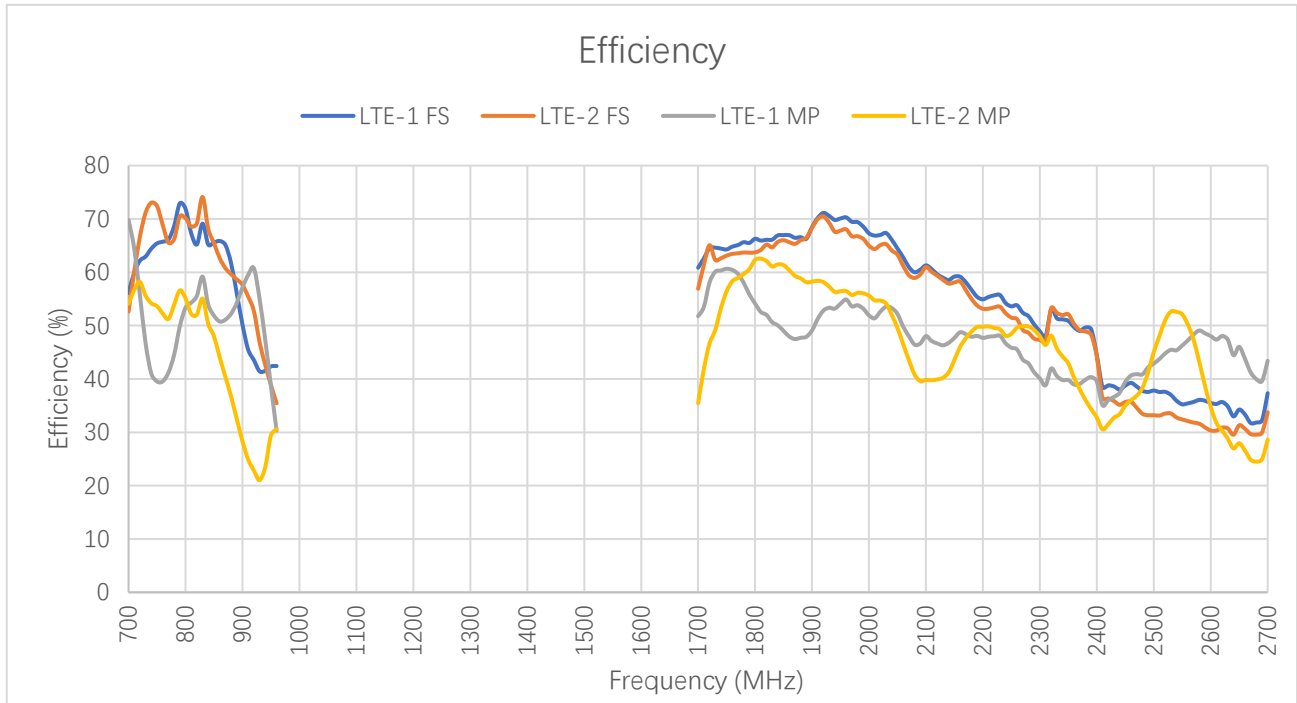


**Noise Figure (dB)**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Noise Figure (dB)	-	-	-	-	-	2.5	2.04	2.43

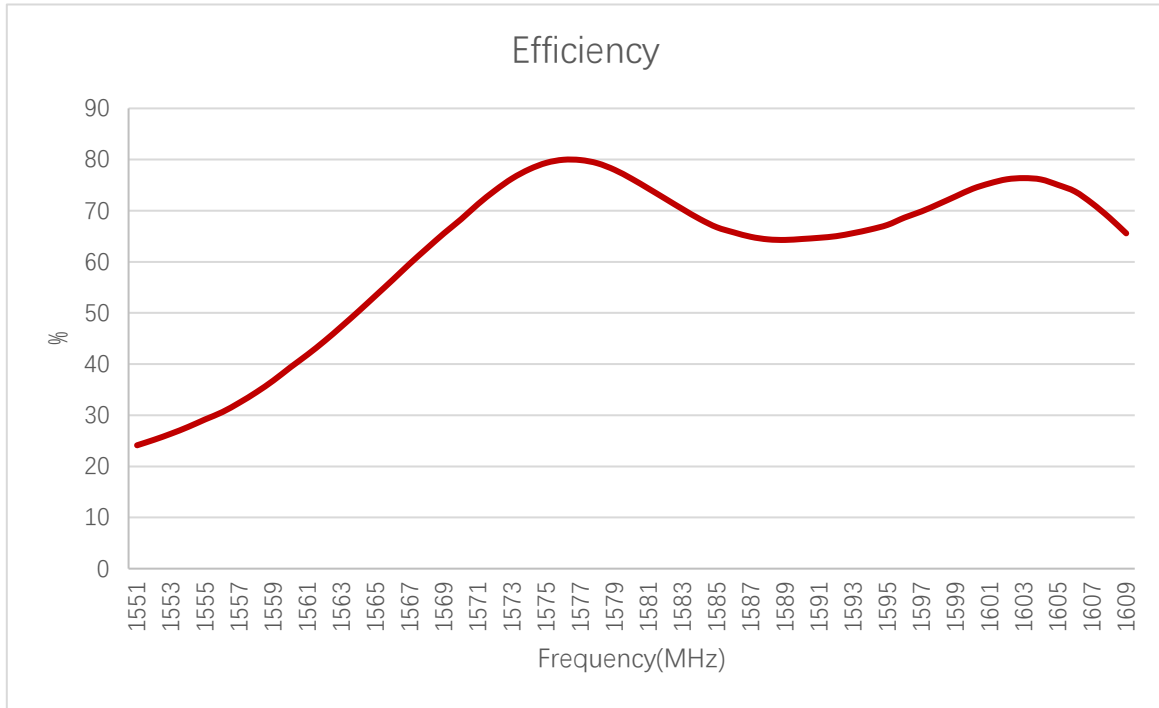
### 3.2. Radiation Performance Test

#### 3.2.1. Efficiency



**Efficiency (%) – LTE**

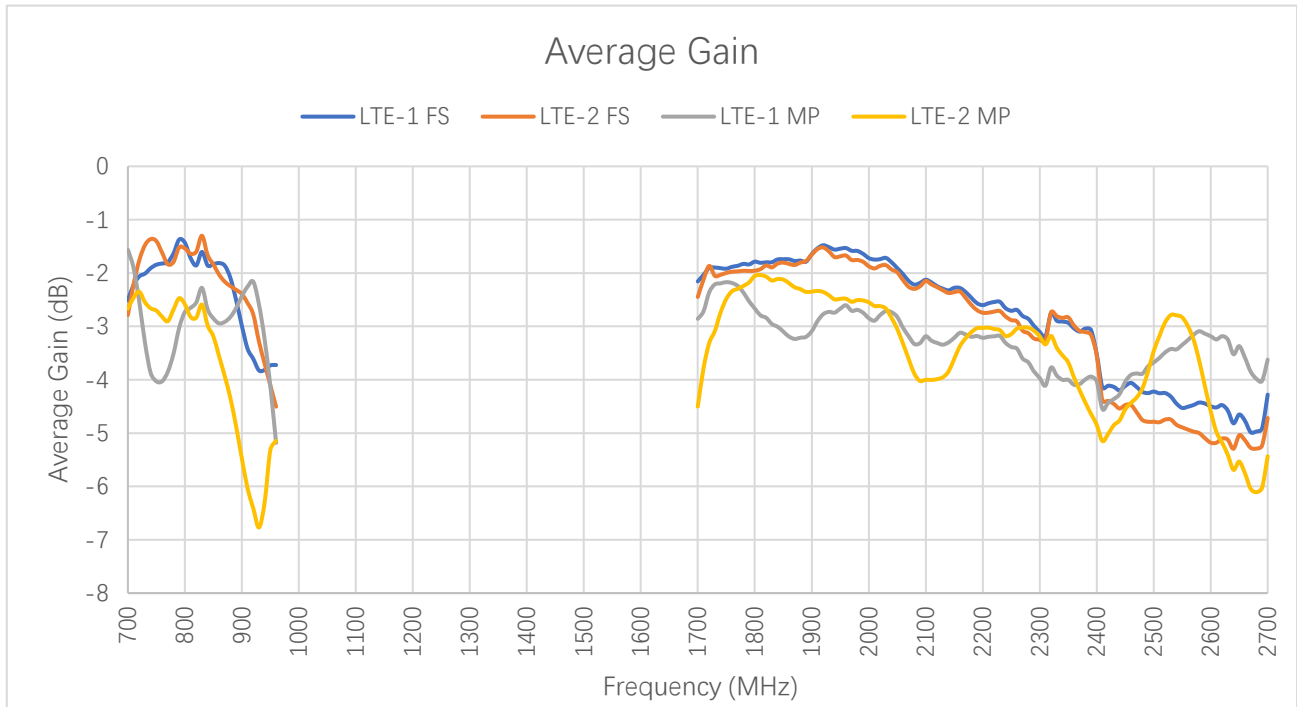
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LTE-1	FS	-	-	60.0	69.1	50.2	42.4	-	62.6	64.4	66.6
	MP	-	-	64.5	59.2	57.1	30.3	-	53.5	60.3	47.7
LTE-2	FS	-	-	60.1	74.1	57.6	35.4	-	61.3	62.6	66.0
	MP	-	-	56.7	55.1	28.3	30.6	-	41.8	53.2	58.9
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
LTE-1	FS	70.1	58.6	50.9	38.8	35.5	32.2	-	-	-	-
	MP	54.1	46.8	39.8	39.5	48.0	39.6	-	-	-	-
LTE-2	FS	67.8	57.9	52.1	35.7	30.3	29.9	-	-	-	-
	MP	56.4	41.3	42.9	35.0	34.8	25.0	-	-	-	-



**Efficiency (%) – GNSS**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Efficiency (%)	-	-	-	-	-	42	79	76

**3.2.2. Average Gain**

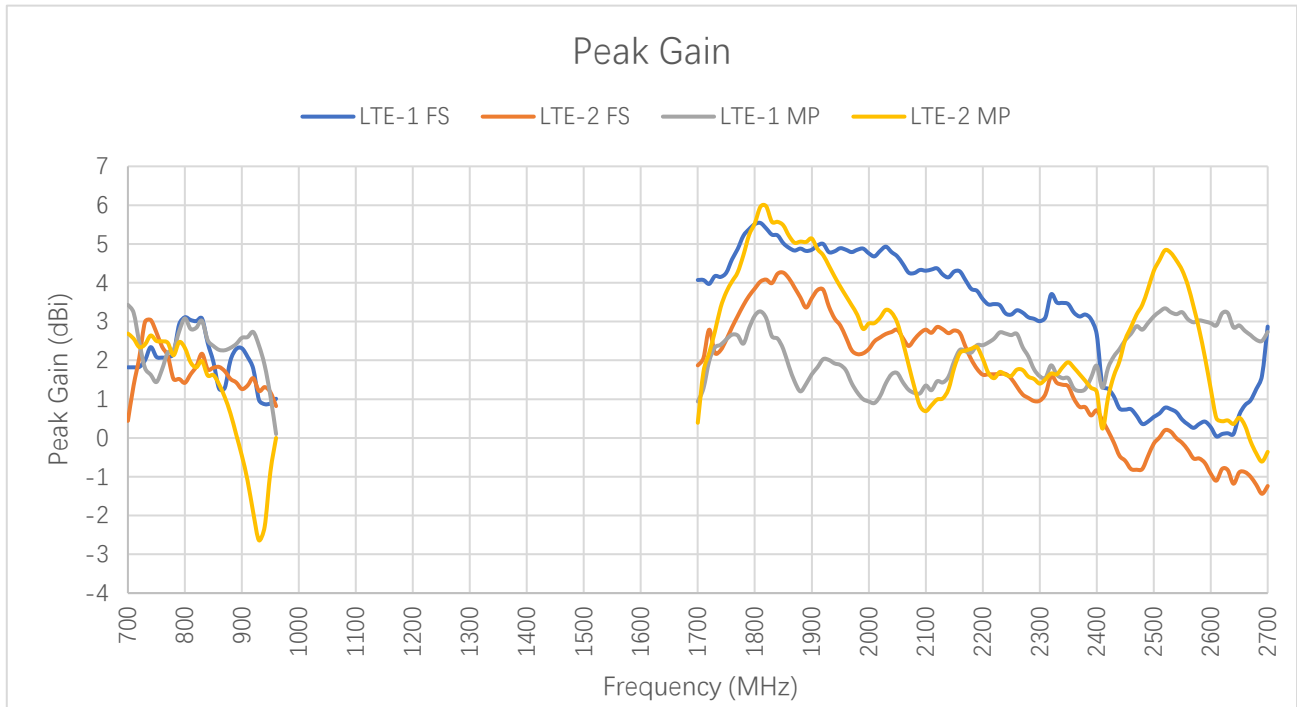


**Average Gain (dB) – LTE**

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LTE-1	FS	-	-	-2.2	-1.6	-3.0	-3.7	-	-2.0	-1.9	-1.8
	MP	-	-	-1.9	-2.3	-2.4	-5.2	-	-2.7	-2.2	-3.2
LTE-2	FS	-	-	-2.2	-1.3	-2.4	-4.5	-	-2.1	-2.0	-1.8
	MP	-	-	-2.5	-2.6	-5.5	-5.1	-	-3.8	-2.7	-2.3
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
LTE-1	FS	-1.5	-2.3	-2.9	-4.1	-4.5	-4.9	-	-	-	-
	MP	-2.7	-3.3	-4.0	-4.0	-3.2	-4.0	-	-	-	-
LTE-2	FS	-1.7	-2.4	-2.8	-4.5	-5.2	-5.2	-	-	-	-
	MP	-2.5	-3.8	-3.7	-4.6	-4.6	-6.0	-	-	-	-

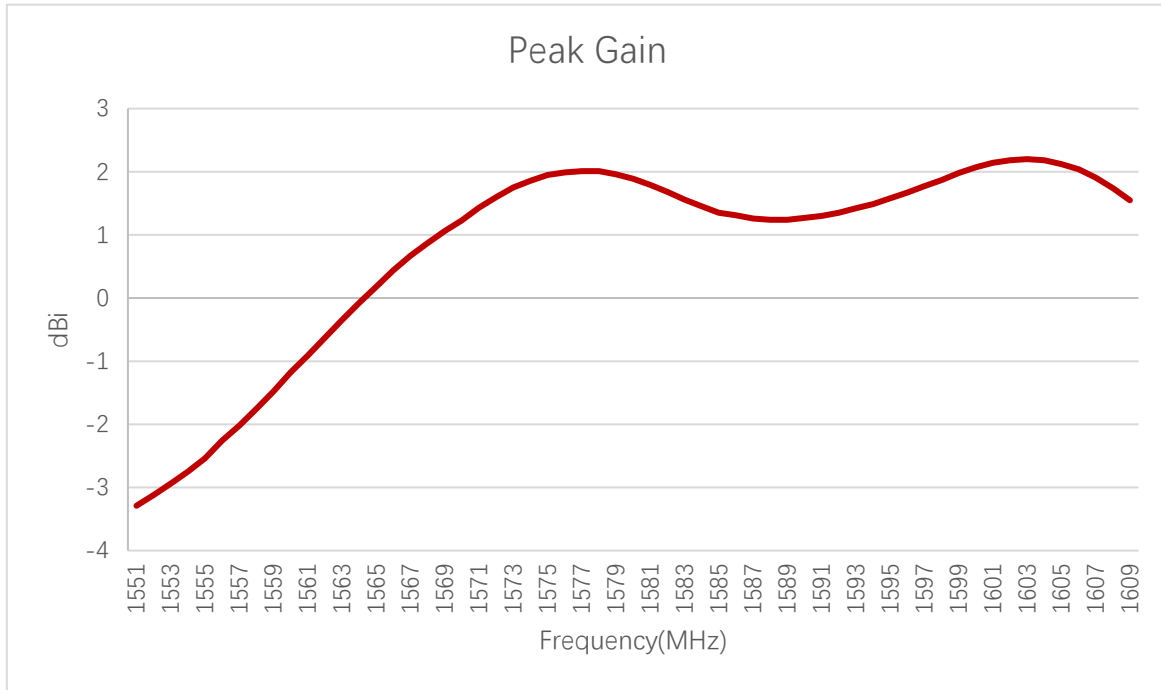


**3.2.3. Peak Gain**



**Peak Gain (dBi) – LTE**

Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
LTE-1	FS	-	-	1.8	3.1	2.3	1.0	-	4.1	4.2	4.9
	MP	-	-	3.2	3.0	2.6	0.1	-	1.3	2.4	1.2
LTE-2	FS	-	-	1.4	2.2	1.3	0.8	-	2.1	2.3	3.6
	MP	-	-	2.6	2.0	-0.5	0.0	-	1.7	3.4	5.1
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
LTE-1	FS	4.9	4.1	3.5	0.7	0.3	1.6	-	-	-	-
	MP	1.9	1.6	1.5	2.5	3.0	2.5	-	-	-	-
LTE-2	FS	2.9	2.7	1.3	-0.6	-0.9	-1.4	-	-	-	-
	MP	3.9	1.3	2.0	2.5	1.3	-0.6	-	-	-	-

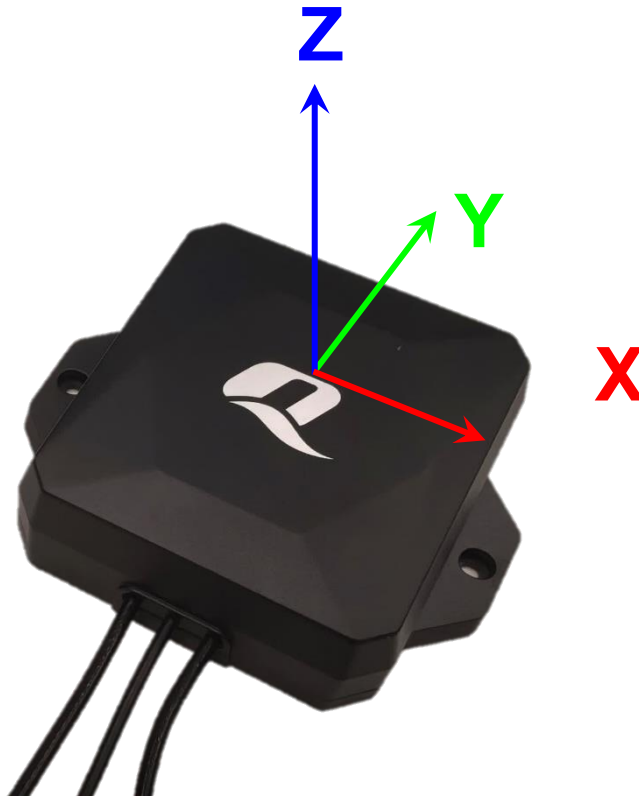


**Peak Gain (dBi) – GNSS**

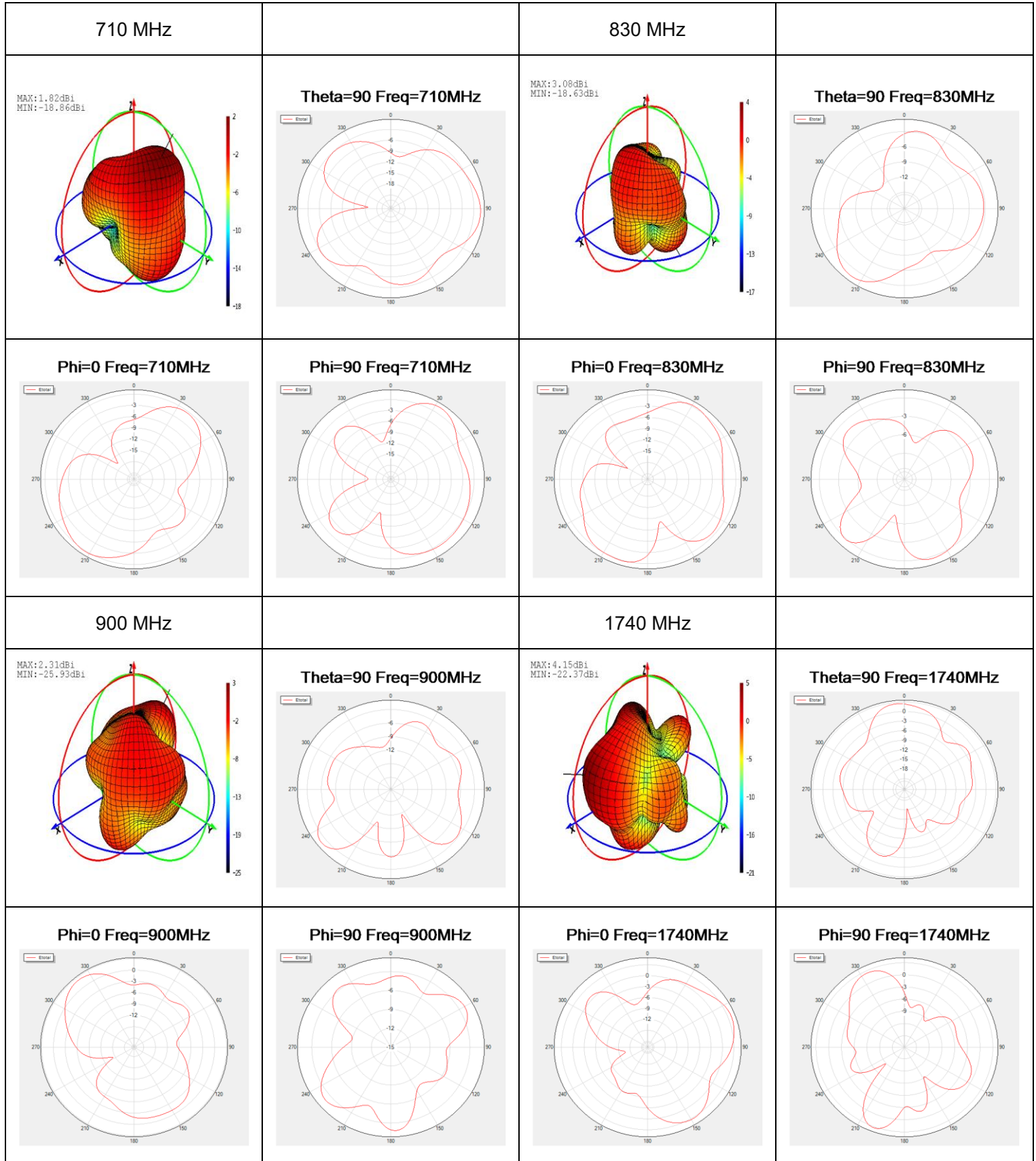
Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Peak Gain (dBi)	-	-	-	-	-	-0.91	1.95	2.18

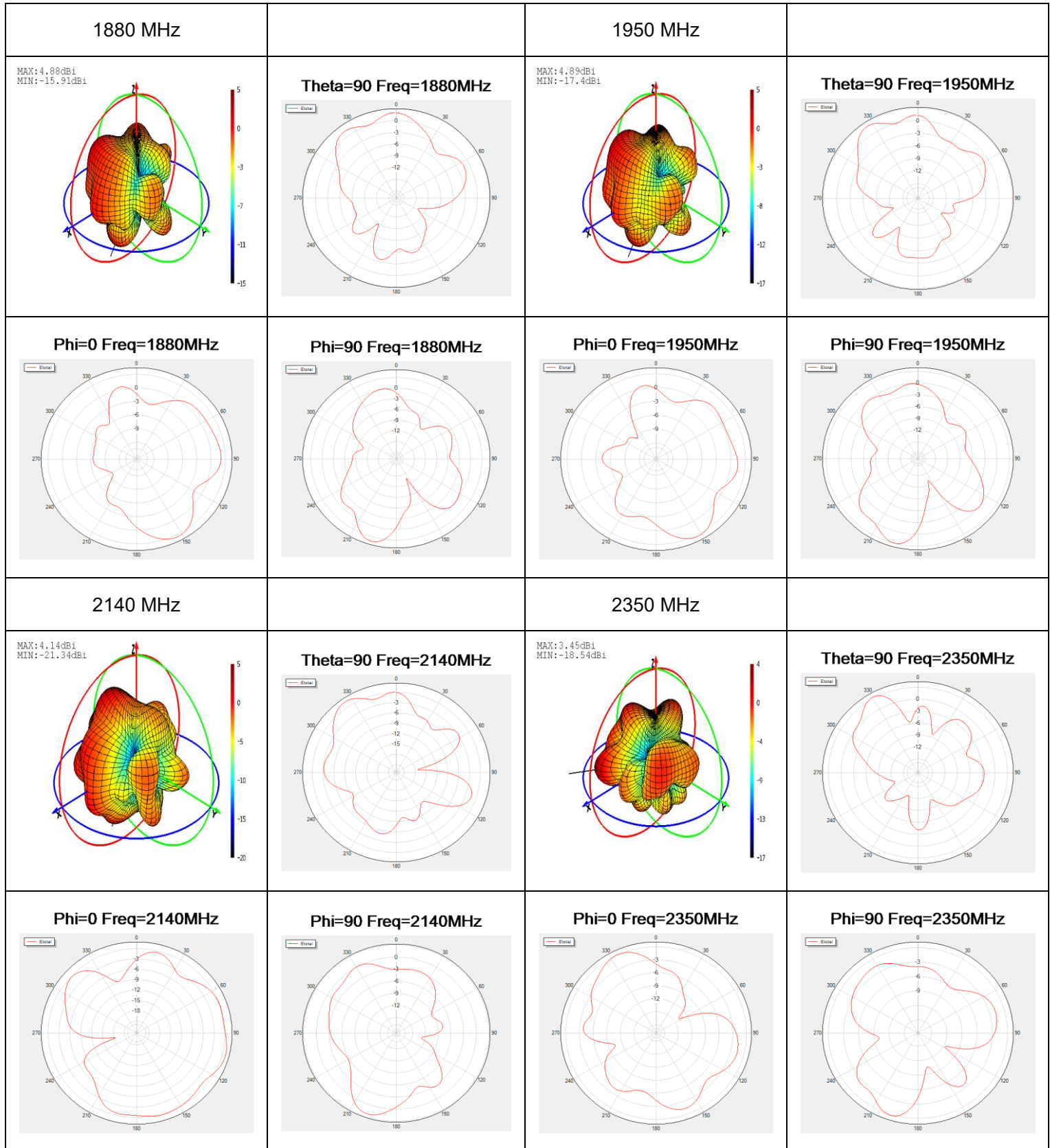
### 3.2.4. 3D & 2D Radiation Pattern

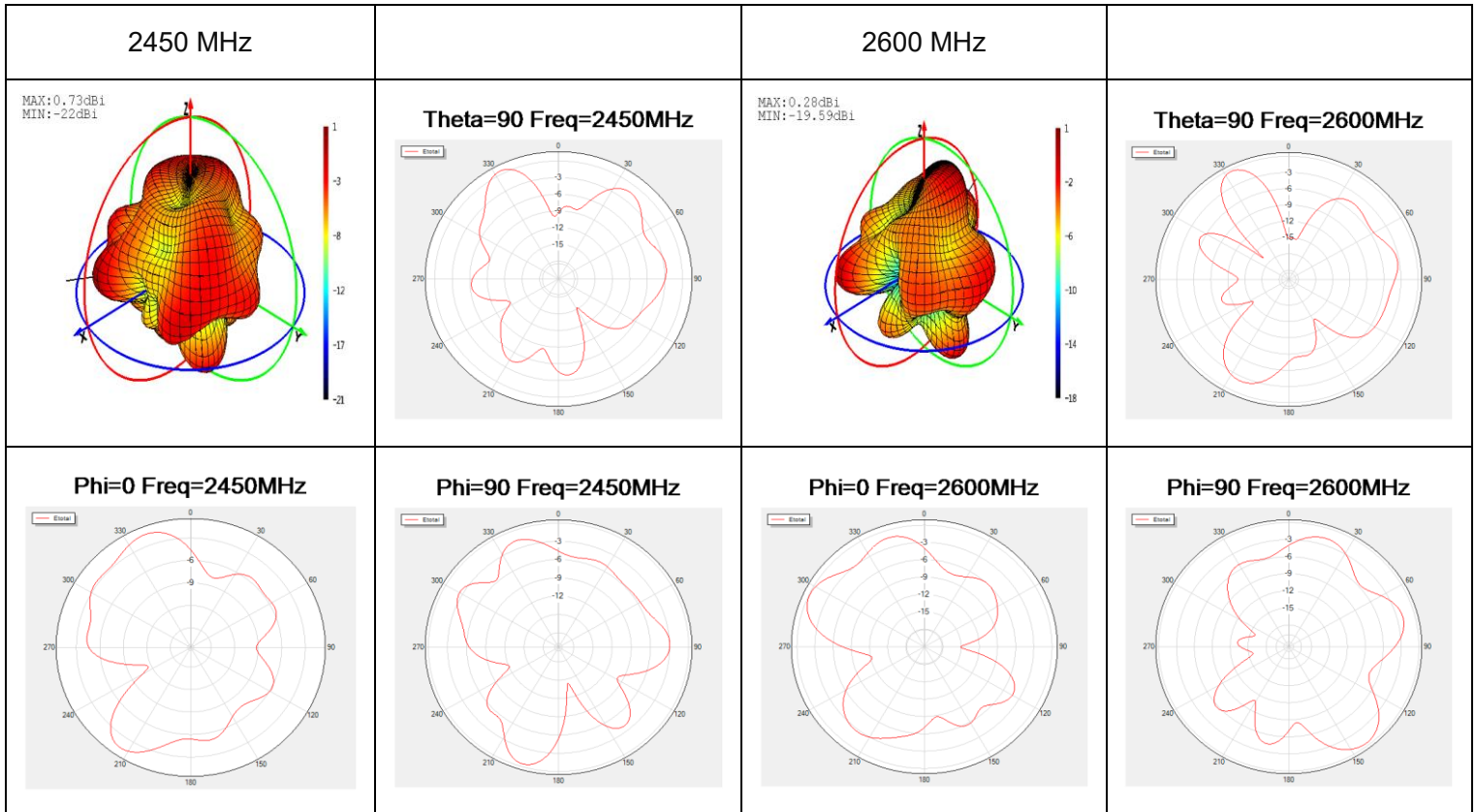
- Test Condition: Free space
- Test Chamber: FS-S-1(LTE); SH-SY-16(GNSS)



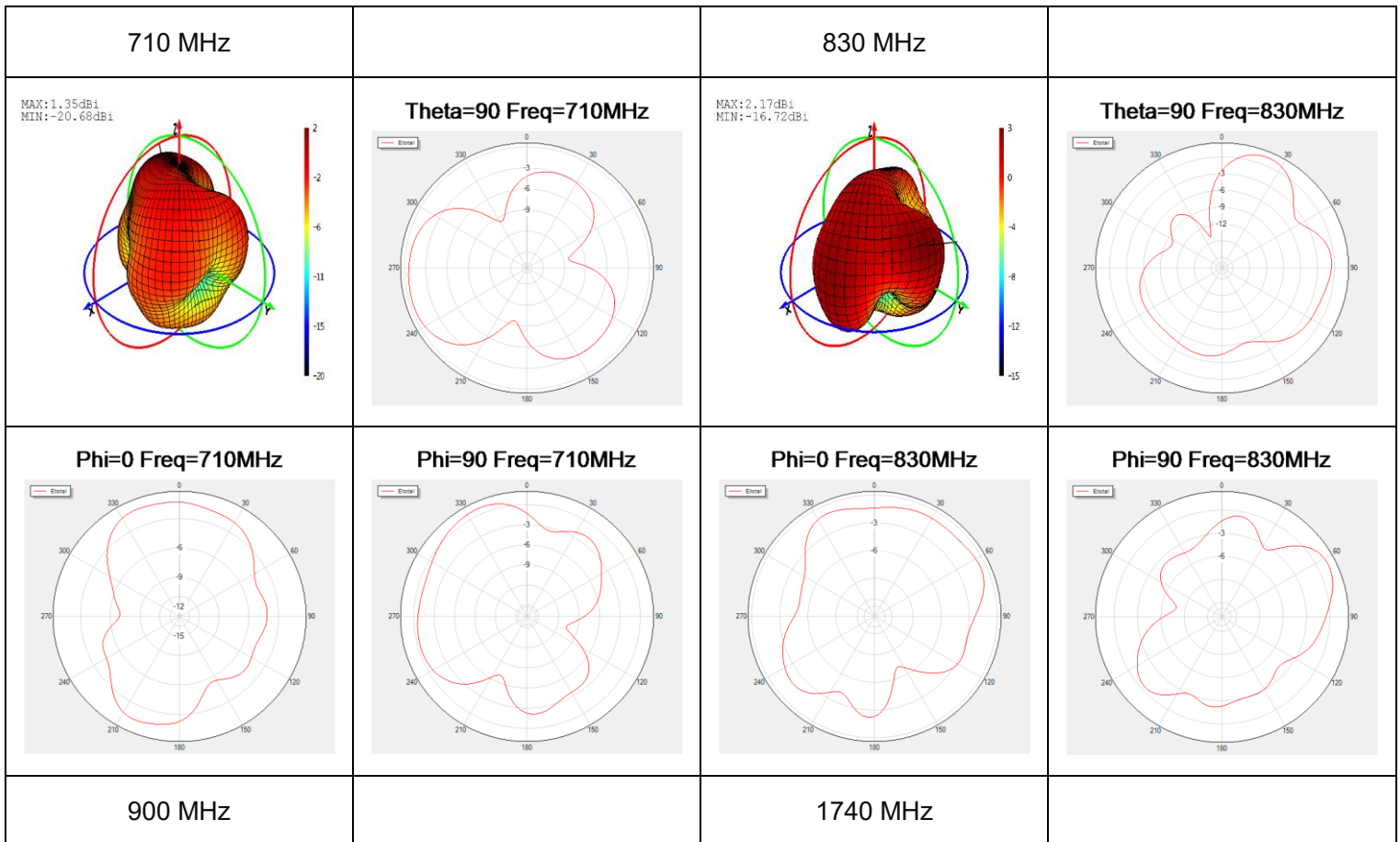
● **LTE-1**



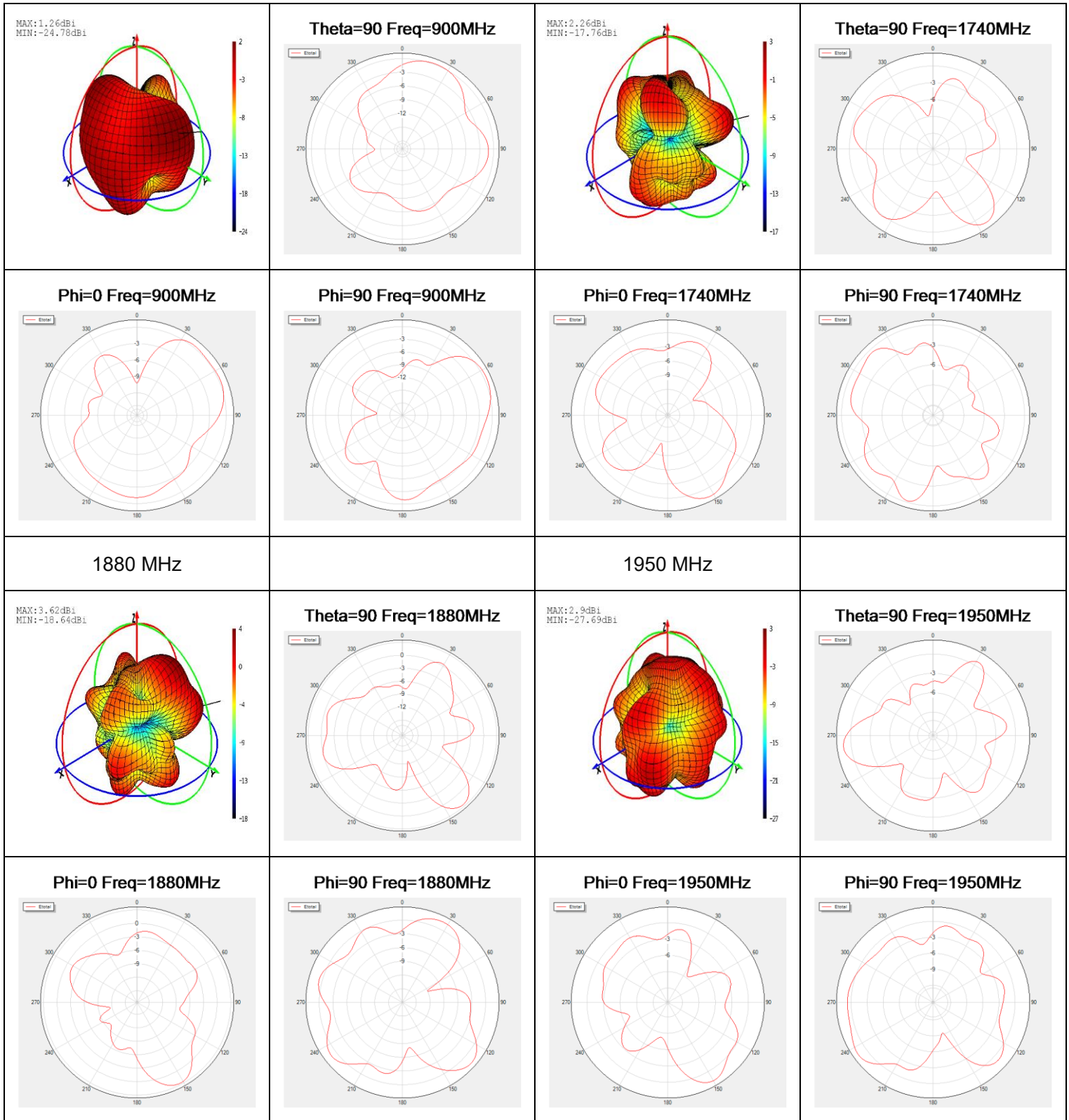


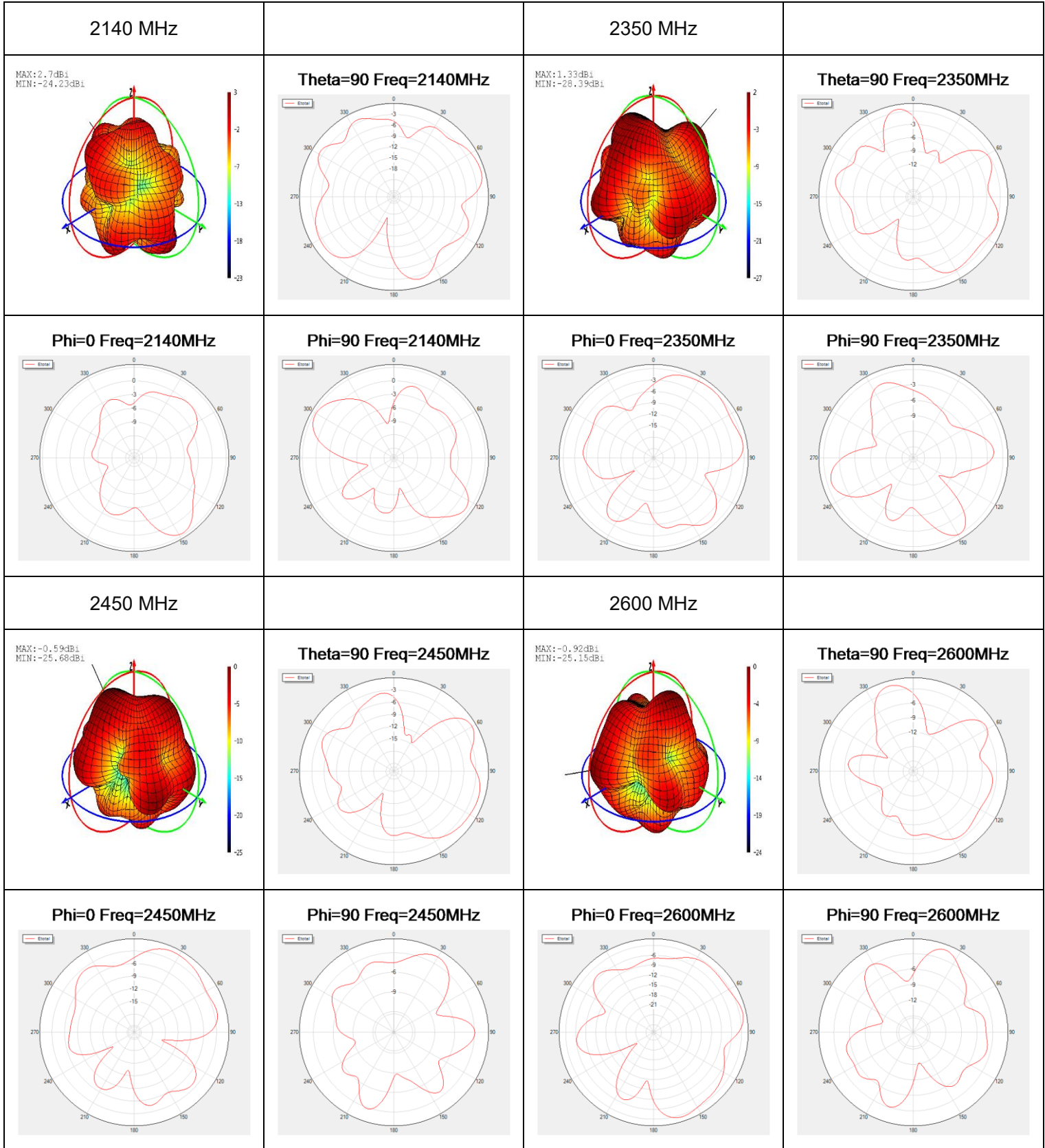


● **LTE-2**





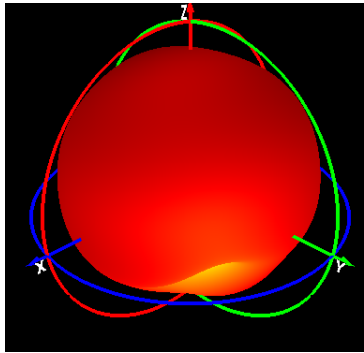




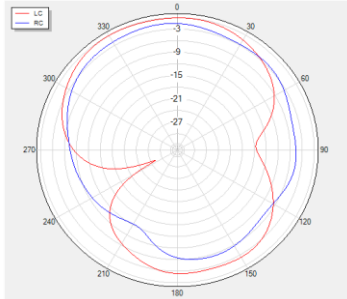


● **GNSS**

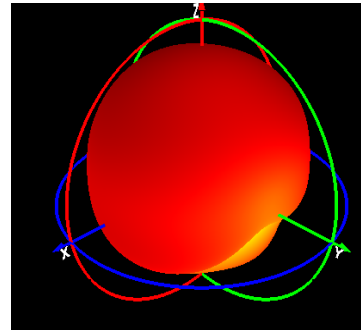
1561 MHz



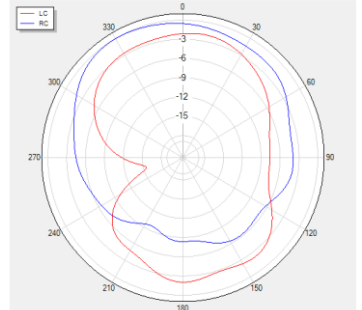
**Phi=0 freq=1561MHz**



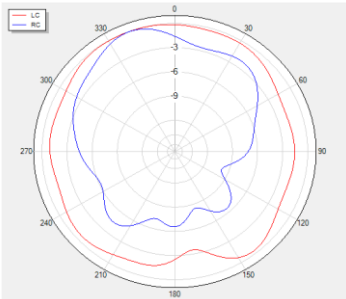
1575 MHz



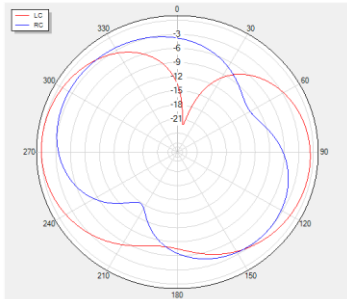
**Phi=0 freq=1575MHz**



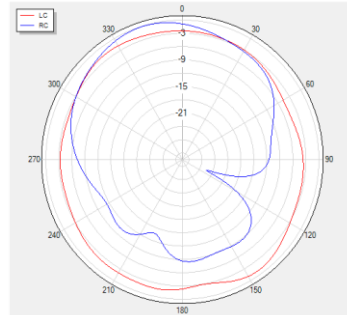
**Phi=90 freq=1561MHz**



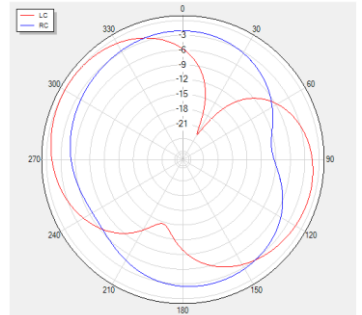
**Theta=90 freq=1561MHz**



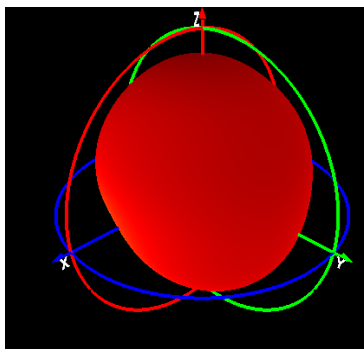
**Phi=90 freq=1575MHz**



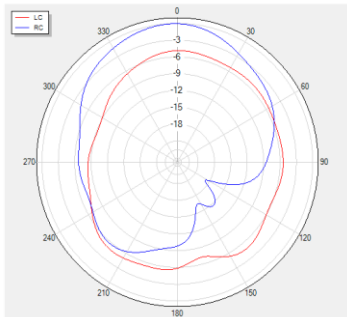
**Theta=90 freq=1575MHz**



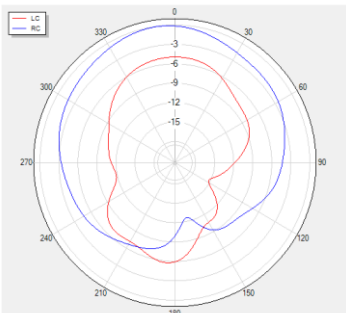
1602 MHz



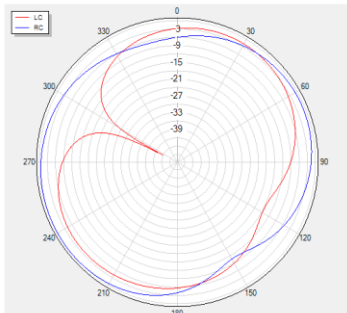
**Phi=0 freq=1602MHz**



**Phi=90 freq=1602MHz**

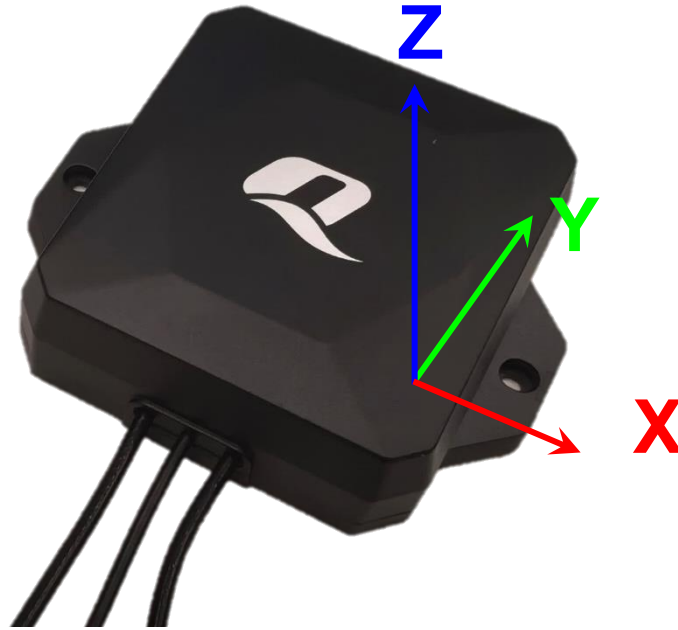


**Theta=90 freq=1602MHz**

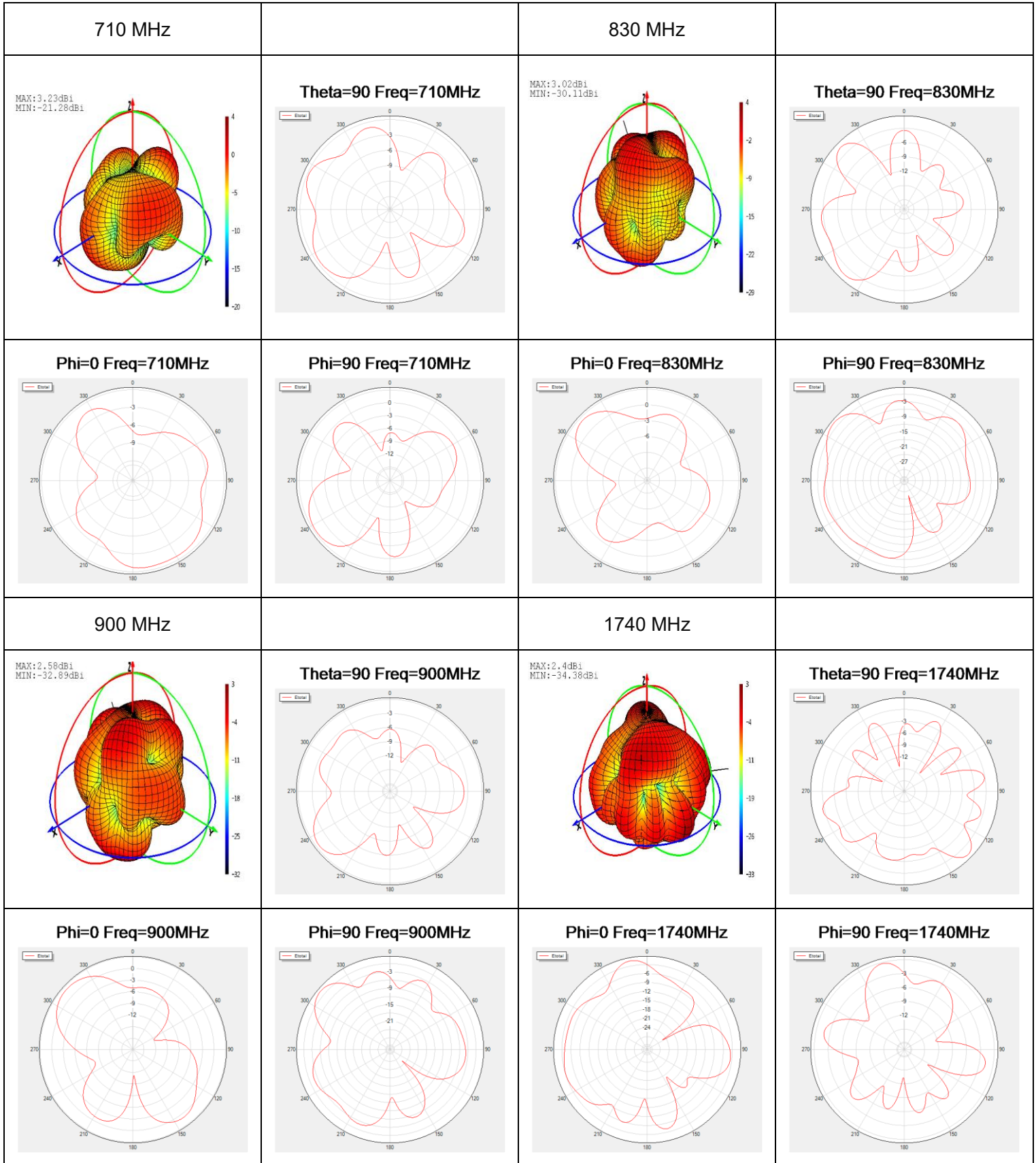


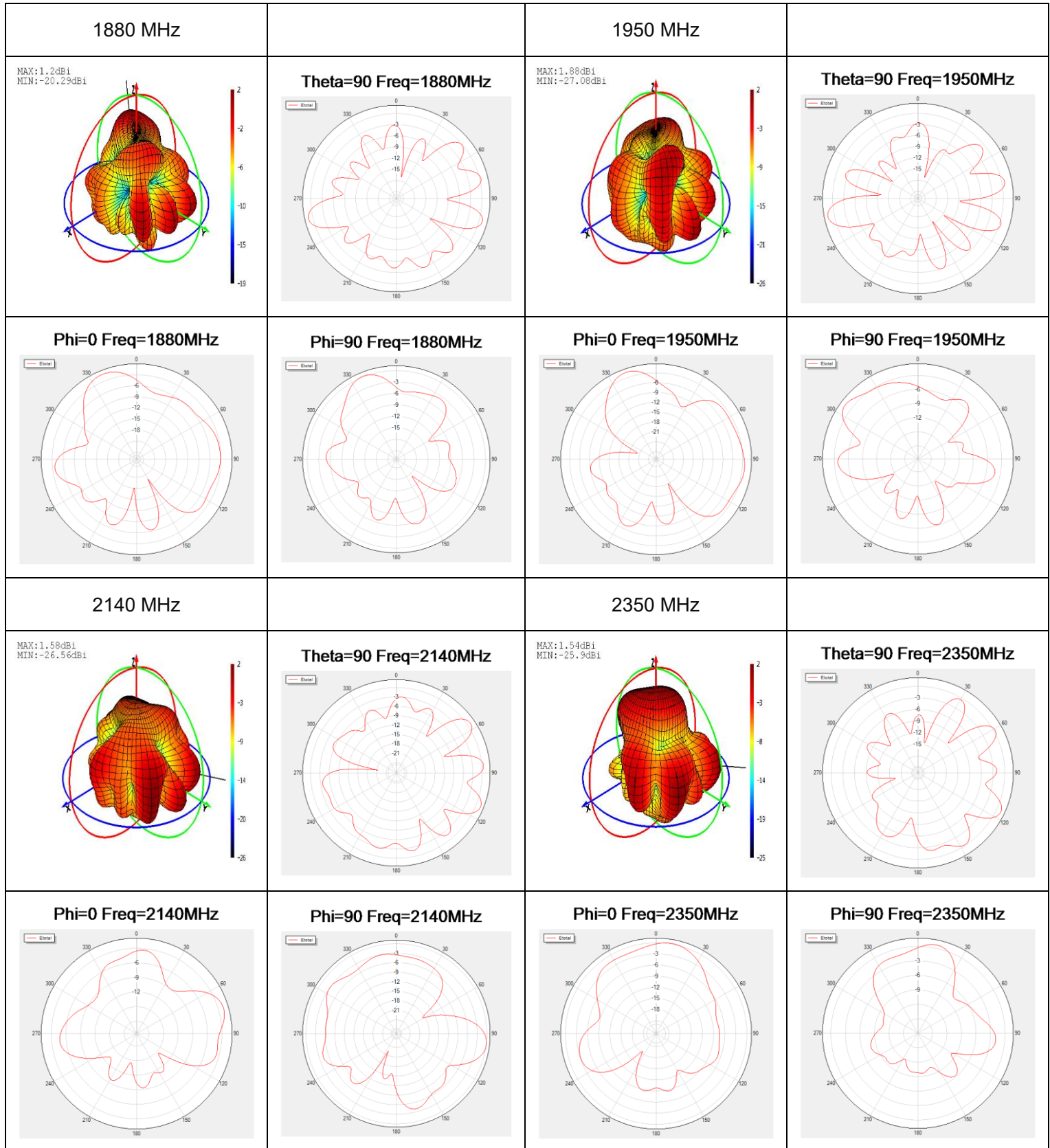
### 3.2.5. 3D & 2D Radiation Pattern

- Test Condition: On 300 mm × 300 mm Metal Plane
- Test Chamber: FS-S-1(LTE)

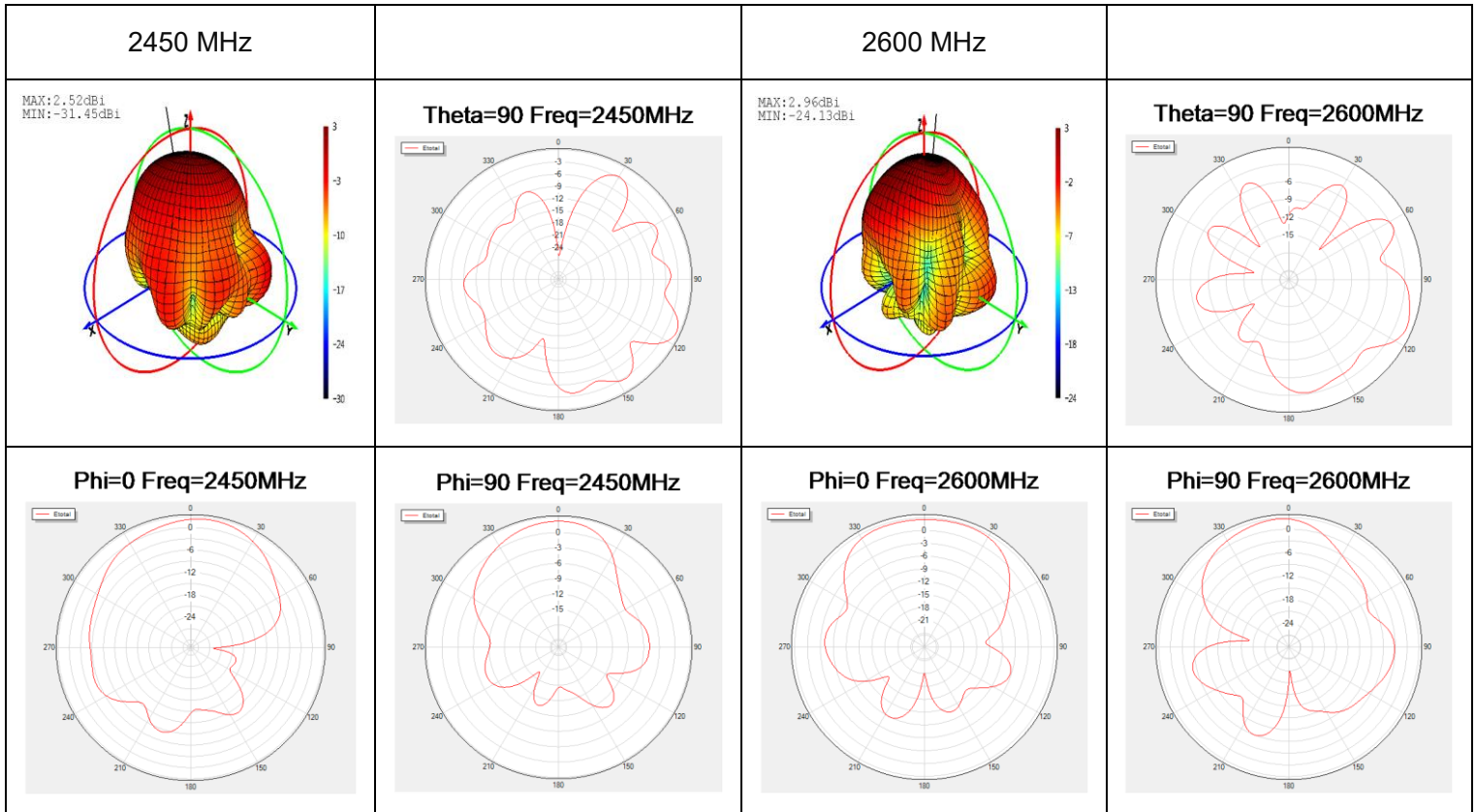


● **LTE-1**

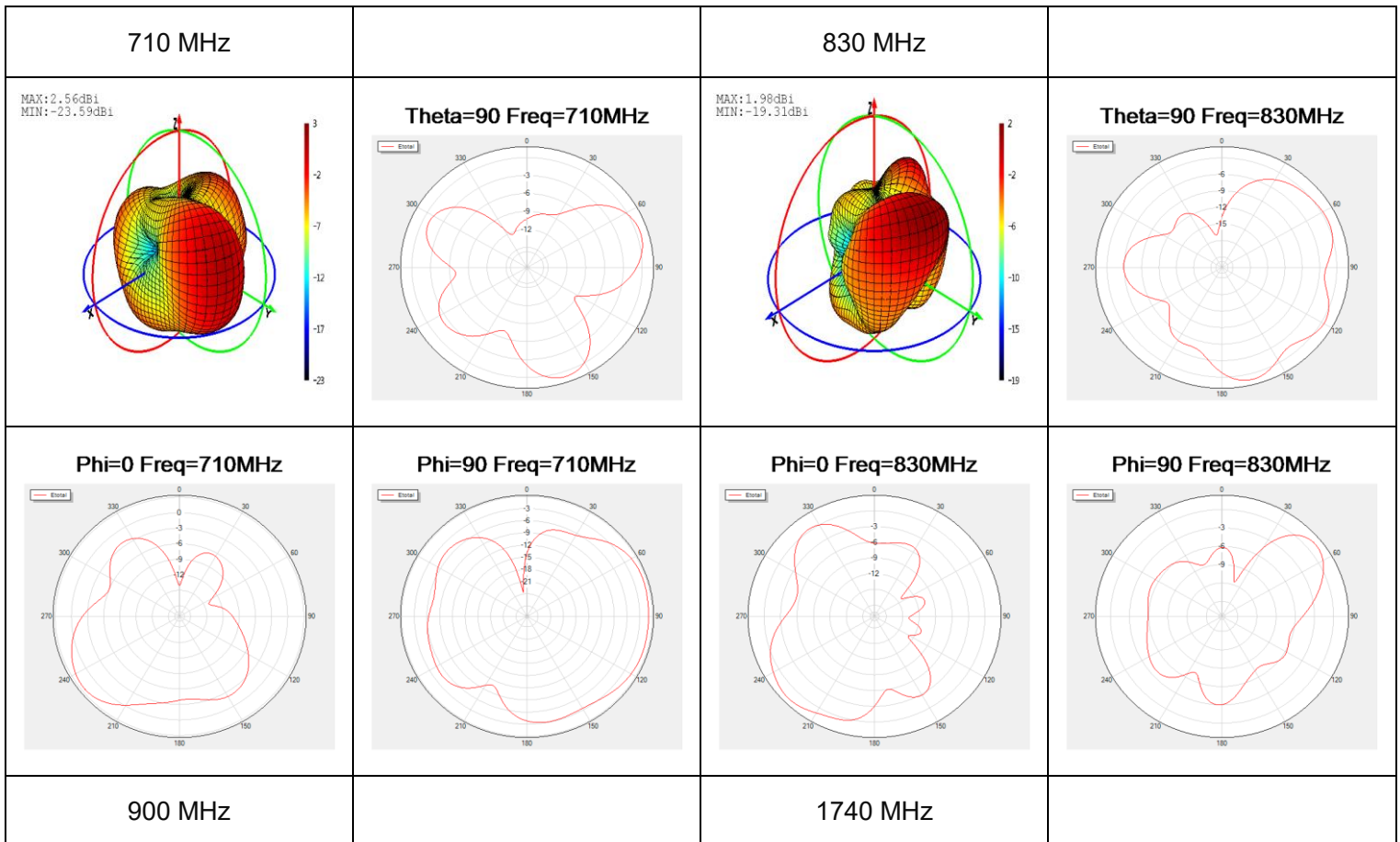


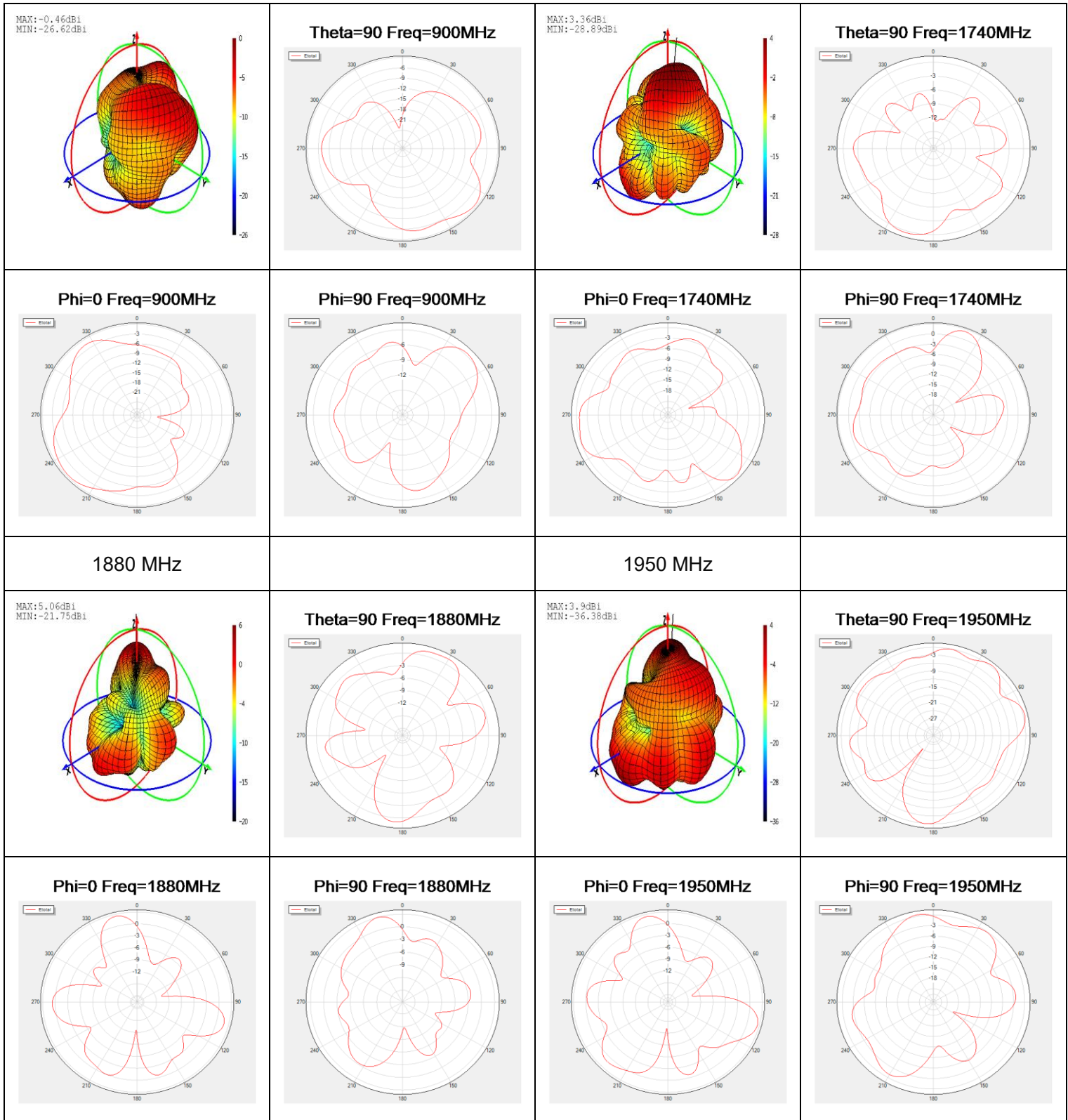


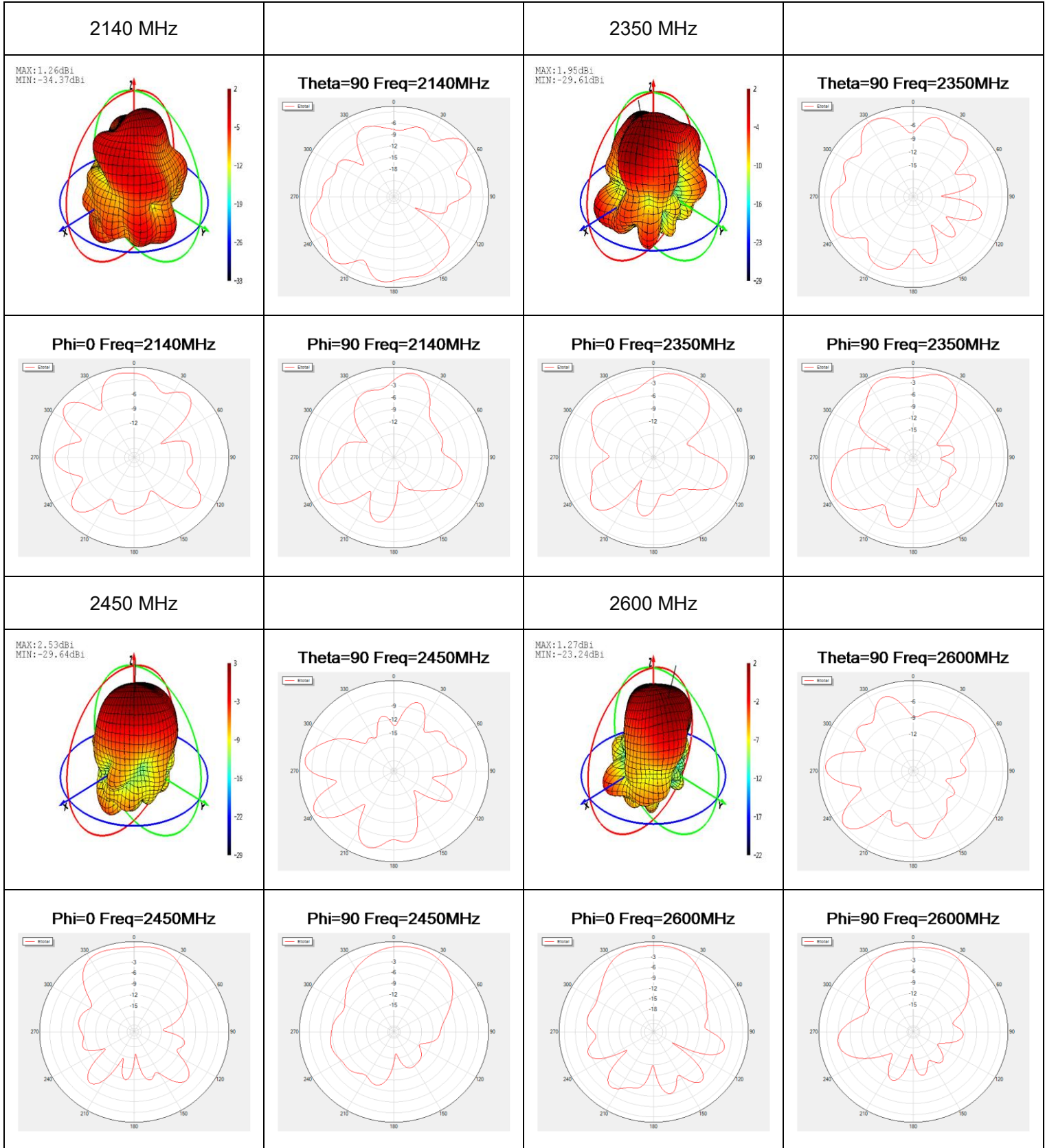







● **LTE-2**



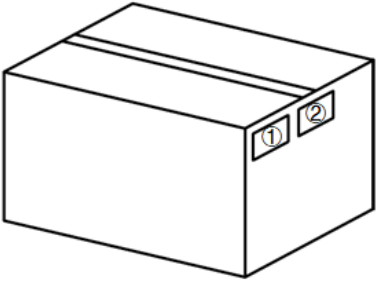
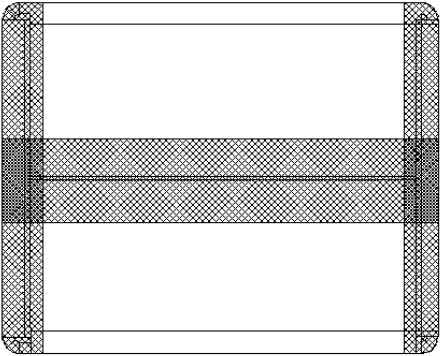




# 4 Packaging

Step	Packaging Picture/2D Picture	Description
1		<p>1 pc antenna product in a PE bag. (1 PC / PE Bag)</p>
2		<p>5 pcs antenna products in an inner box. (5 PCS / Inner Box)</p>
3		<p>(6 Inner Boxes / Carton Box) (30 PCS Antennas / Carton Box)</p> <p><u>Carton Size:</u> <u>L × W × H = 600 × 404 × 164 mm</u></p>



4		<p><b>Position for Attaching Labels</b></p> <ul style="list-style-type: none"><li>① Carton Label</li><li>② Quality Label</li></ul>
5		<p><b>Sealing Cartons</b> “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:**

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Email: [info@quectel.com](mailto:info@quectel.com)

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

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# Revision History

Version	Date	Author	Note
-	2024-06-05	Mordecai LIU/ Junsen LI/ Rojin LUO/ David LIU/ Rainey LIAO	Creation of the document
1.0	2024-06-05	Mordecai LIU/ Junsen LI/ Rojin LUO/ David LIU/ Rainey LIAO	First official release
1.1	2024-11-07	Junsen LI	<ol style="list-style-type: none"><li>Updated block diagram (Chapter 1.3).</li><li>Added 1561 MHz test data.</li></ol>

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