

# Specification

- Part No. : **MA350.A.LBICG.003**
- Product Name : Steedan 5-in-1 Magnetic Mount Antenna with GNSS, 2\*LTE & 2\*Wi-Fi
- Features : Low Profile Magnetic Mount Enclosure  
2\* LTE MIMO 698-960MHz / 1710-2170MHz / 2490-2690MHz / 3300-3600MHz  
2\* Wi-Fi MIMO 2.4GHz/5.8GHz  
1\* GPS-GLONASS-GALILEO-BeiDou Antenna  
IP65 Rated, Ruggedized PC/ABS Enclosure  
LTE: 3M CFD200 Cable and SMA(M)ST Connector  
Wi-Fi: 3M CFD200 Cable and RP SMA(M)ST Connector  
GNSS: 3M RG-174 Cable and SMA(M)ST Connector  
Dims: 247 \* 144.3 \* 47.8 mm

**RoHS Compliant**



## 1. Introduction

The Taoglas Steedan MA350 is a 5-in-1 next-generation low profile magnetic mount antenna for vehicle, outdoor building and heavy equipment roof applications. It has a fully IP65 rated waterproof robust ABS enclosure and base. This is an ideal external combination antenna solution that is used where drilling a hole through the roof of a vehicle or a metal panel is not feasible. It can be mounted on steel surfaces and its ultra-strong neodymium magnets. A soft foam cushion on the base protects the mounting surface during installation and removal. Only 48mm high it mounts discretely to the target application out of sight of most onlookers.

This outstanding antenna delivers powerful MIMO antenna technology for LTE (2G/3G/4G) and Wi-Fi 2.4/5.8GHz and a custom tuned GPS/GLONASS/BeiDou patch antenna for GNSS location services. The 5 internal antennas have superior isolation. The LTE antennas also include backward compatibility to work at most worldwide 3G and 2G bands.

Typical Applications:

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

The MA350 is ideal for applications that require highly sophisticated antennas for real-time streaming applications that demand high-speed video uplink and downlink into the cabin of the vehicle. These challenges are resolved by the highly efficient, high gain MIMO antennas, with high isolation, all of which is necessary to achieve the required signal to noise ratio and throughput.

The MA350 can also be customized for your particular wireless application and frequency band, subject to NRE and MOQ. There are 5x 3000mm low loss TGC-200 cables, terminating in SMA(M) connectors for LTE MIMO, and RP SMA(M) for Wi-Fi MIMO. There is a 3000mm RG-174 cable for GNSS terminating in an SMA(M) connector. All cable lengths and connector types are customizable.

## 2. Specification

### LTE MIMO1 & MIMO 2 on 30x30cm Ground Plane

LTE Antenna								
Frequency (MHz)	LTE700	GSM850	GSM900	DCS	PCS	UMTS1	LTE2600	
	698~824	824~894	880~960	1710~1880	1850~1990	1920~2170	2490~2690	
Efficiency (%)								
MIMO1	0.3M	42.71	66.20	69.35	54.36	60.18	62.55	65.55
	1M	40.51	63.21	66.22	49.56	54.89	57.63	59.78
	2M	37.81	57.93	60.39	44.17	48.52	50.52	51.94
	3M	34.94	53.80	56.13	39.27	42.70	44.65	45.22
	5M	32.30	49.97	52.18	34.91	37.59	39.46	39.38
MIMO2	0.3M	43.39	46.55	42.78	49.60	48.61	54.25	64.76
	1M	41.10	44.44	40.85	45.25	44.32	49.96	59.06
	2M	38.35	40.72	37.26	40.33	39.16	43.81	51.32
	3M	35.53	37.83	34.62	35.87	34.48	38.70	44.67
	5M	32.91	35.14	32.17	31.90	30.36	34.19	38.90
Average Gain (dB)								
MIMO1	0.3M	-3.70	-1.79	-1.59	-2.65	-2.21	-2.04	-1.83
	1M	-3.92	-1.99	-1.79	-3.05	-2.61	-2.39	-2.23
	2M	-4.22	-2.37	-2.19	-3.55	-3.14	-2.97	-2.85
	3M	-4.57	-2.69	-2.51	-4.06	-3.70	-3.50	-3.45
	5M	-4.91	-3.01	-2.82	-4.57	-4.25	-4.04	-4.05
MIMO2	0.3M	-3.63	-3.32	-3.69	-3.05	-3.13	-2.66	-1.89
	1M	-3.86	-3.52	-3.89	-3.44	-3.53	-3.01	-2.29
	2M	-4.16	-3.90	-4.29	-3.94	-4.07	-3.58	-2.90
	3M	-4.49	-4.22	-4.61	-4.45	-4.62	-4.12	-3.50
	5M	-4.83	-4.54	-4.93	-4.96	-5.18	-4.66	-4.10
Peak Gain (dBi)								
MIMO1	0.3M	-2.30	-1.57	-1.14	-2.48	-1.83	-1.76	-1.29
	1M	-2.50	-1.77	-1.34	-2.88	-2.23	-2.14	-1.69
	2M	-2.80	-2.17	-1.74	-3.38	-2.83	-2.66	-2.30
	3M	-3.20	-2.47	-2.04	-3.88	-3.33	-3.24	-2.94
	5M	-3.60	-2.77	-2.34	-4.38	-3.83	-3.74	-3.54
MIMO2	0.3M	-2.42	-2.86	-3.13	-2.62	-2.51	-1.80	-1.10
	1M	-2.72	-3.06	-3.33	-3.02	-2.91	-2.20	-1.50
	2M	-3.02	-3.46	-3.73	-3.52	-3.51	-2.70	-2.10
	3M	-3.32	-3.76	-4.13	-4.02	-4.01	-3.30	-2.70
	5M	-3.62	-4.06	-4.45	-4.52	-4.51	-3.90	-3.30
Impedance	50 Ω							
Polarization	Linear							

### WI-FI\_MIMO1 and MIMO2\_On 30x30cm Ground Plane

<b>Wi-Fi Antenna (2.4GHz/5.8GHz)</b>			
Frequency (MHz)		2400~2500	4900~5850
<b>Efficiency (%)</b>			
MIMO1	0.3M	64.14	52.70
	1M	58.48	45.39
	2M	50.93	36.79
	3M	44.36	29.79
	5M	38.64	24.13
MIMO2	0.3M	44.33	57.67
	1M	40.43	49.64
	2M	35.21	40.23
	3M	30.67	32.57
	5M	26.71	26.37
<b>Average Gain (dB)</b>			
MIMO1	0.3M	-1.93	-2.78
	1M	-2.33	-3.43
	2M	-2.93	-4.34
	3M	-3.53	-5.26
	5M	-4.13	-6.17
MIMO2	0.3M	-3.53	-2.39
	1M	-3.93	-3.04
	2M	-4.53	-3.95
	3M	-5.13	-4.87
	5M	-5.73	-5.79
<b>Peak Gain (dBi)</b>			
MIMO1	0.3M	-1.67	-1.95
	1M	-2.07	-2.55
	2M	-2.67	-3.45
	3M	-3.27	-4.34
	5M	-3.87	-5.14
MIMO2	0.3M	-2.82	-1.65
	1M	-3.22	-2.35
	2M	-3.82	-3.25
	3M	-4.42	-4.15
	5M	-5.02	-5.05
Impedance	50 Ω		
Return loss	< -6 dB		
Polarization	Linear		



**GNSS ELECTRICAL**

Frequency	GPS L1: 1575.42 MHz $\pm$ 1.023 MHz GLONASS L1: 1602 MHz $\pm$ 1.023 MHz		
Bandwidth - Return Loss <-10 dB	6 MHz min		
Return loss (GPS L1 GLONASS L1)	< -10 dB		
Passive Gain at Zenith (GPS L1 and GLONASS L1)	+1.0 dBic typ.		
Polarization	RHCP		
Impedance	50 $\Omega$		
LNA Out-band Attenuation	fo = 1575.42MHz fo $\pm$ 30 MHz 5dB Min. fo $\pm$ 50 MHz 20dB Min. fo $\pm$ 100 MHz 25dB Min.		
Input Voltage	Min:1.8V	Typ. 3.0V	Max: 5.5V
Total Gain @ Zenith	25dBic	30dBic	32dBic
Current Consumption	6mA	12mA	30mA
Noise Figure	2.7dB	3.0dB	3.7dB

<b>MECHANICAL</b>	
Dimensions	247*144.3*47.78 mm
Cable	LTE MIMO 1 & 2: 3000mm TGC200 Wi-Fi MIMO & 2: 3000mm TGC200 GNSS: 3000mm RG174
Connector	LTE: SMA(M) Wi-Fi: RP SMA(M) GNSS: SMA(M)
Casing	PC+ABS
Adhesive	3M 9448HK + CR4305
Sealant	Rubber Stopper
Weight	550 g
<b>ENVIRONMENTAL</b>	
Protection	IP67
Corrosion	5% NaCl for 96hrs - Nickel plated steel base and thread
Temperature Range	-40°C to +85°C
Thermal Shock	100 cycles -40°C to +85°C
Humidity	Non-condensing 65°C 95% RH
Shock (Drop Test)	1m drop on concrete 6 axes
Cable Pull	8 Kgf
Recommended Mounting Torque	24.5N·m
Maximum Mounting Torque	29.5N·m

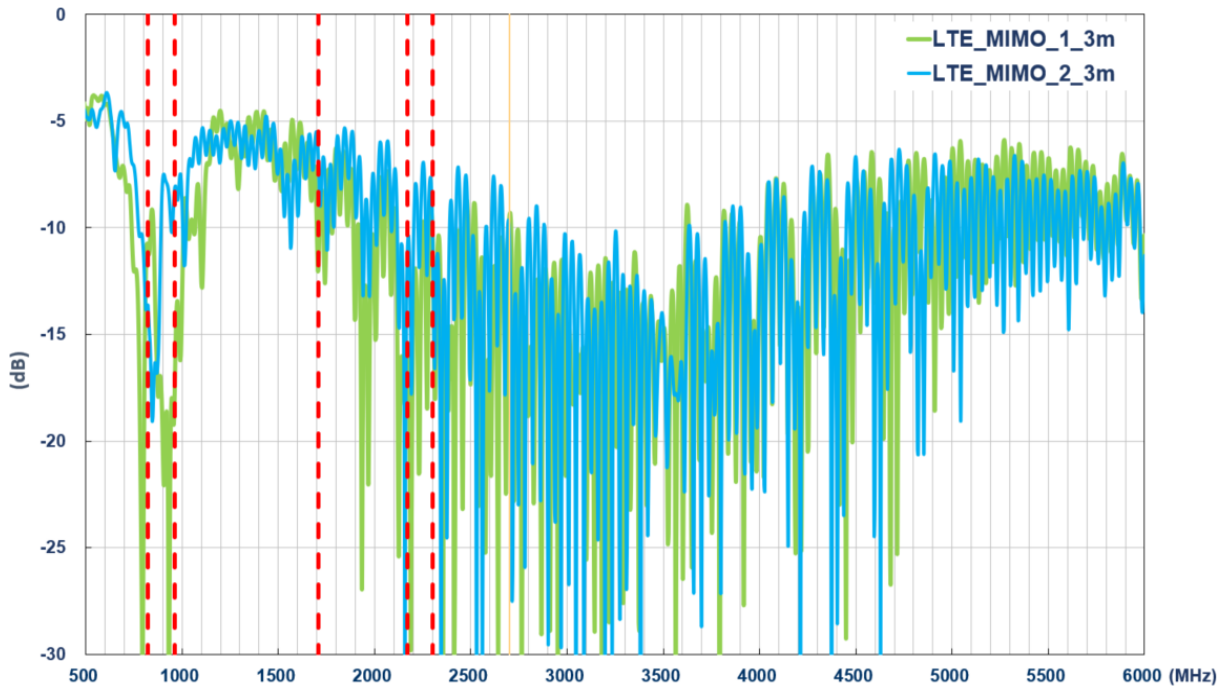
LTE BANDS				
Band Number	LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA			
	Uplink	Downlink	MIMO 1	MIMO 2
1	UL: 1920 to 1980	DL: 2110 to 2170	✓	✓
2	UL: 1850 to 1910	DL: 1930 to 1990	✓	✓
3	UL: 1710 to 1785	DL: 1805 to 1880	✓	✓
4	UL: 1710 to 1755	DL: 2110 to 2155	✓	✓
5	UL: 824 to 849	DL: 869 to 894	✓	✓
7	UL: 2500 to 2570	DL: 2620 to 2690	✓	✓
8	UL: 880 to 915	DL: 925 to 960	✓	✓
9	UL: 1749.9 to 1784.9	DL: 1844.9 to 1879.9	✓	✓
11	UL: 1427.9 to 1447.9	DL: 1475.9 to 1495.9	✓	✓
12	UL: 699 to 716	DL: 729 to 746	✓	✓
13	UL: 777 to 787	DL: 746 to 756	✓	✓
14	UL: 788 to 798	DL: 758 to 768	✓	✓
17	UL: 704 to 716	DL: 734 to 746 (LTE only)	✓	✓
18	UL: 815 to 830	DL: 860 to 875 (LTE only)	✓	✓
19	UL: 830 to 845	DL: 875 to 890	✓	✓
20	UL: 832 to 862	DL: 791 to 821	✓	✓
21	UL: 1447.9 to 1462.9	DL: 1495.9 to 1510.9	✓	✓
22	UL: 3410 to 3490	DL: 3510 to 3590	✓	✓
23	UL: 2000 to 2020	DL: 2180 to 2200 (LTE only)	✓	✓
24	UL: 1625.5 to 1660.5	DL: 1525 to 1559 (LTE only)	✓	✓
25	UL: 1850 to 1915	DL: 1930 to 1995	✓	✓
26	UL: 814 to 849	DL: 859 to 894	✓	✓
27	UL: 807 to 824	DL: 852 to 869 (LTE only)	✓	✓
28	UL: 703 to 748	DL: 758 to 803 (LTE only)	✓	✓
29	UL: -	DL: 717 to 728 (LTE only)	✓	✓
30	UL: 2305 to 2315	DL: 2350 to 2360 (LTE only)	✓	✓
31	UL: 452.5 to 457.5	DL: 462.5 to 467.5 (LTE only)	✓	✓
32	UL: -	DL: 1452 - 1496	✓	✓
35		1850 to 1910	✓	✓
38		2570 to 2620	✓	✓
39		1880 to 1920	✓	✓
40		2300 to 2400	✓	✓
41		2496 to 2690	✓	✓
42		3400 to 3600	✓	✓
43		3600 to 3800	✓	✓

\*Covered bands represent an efficiency greater than 20%

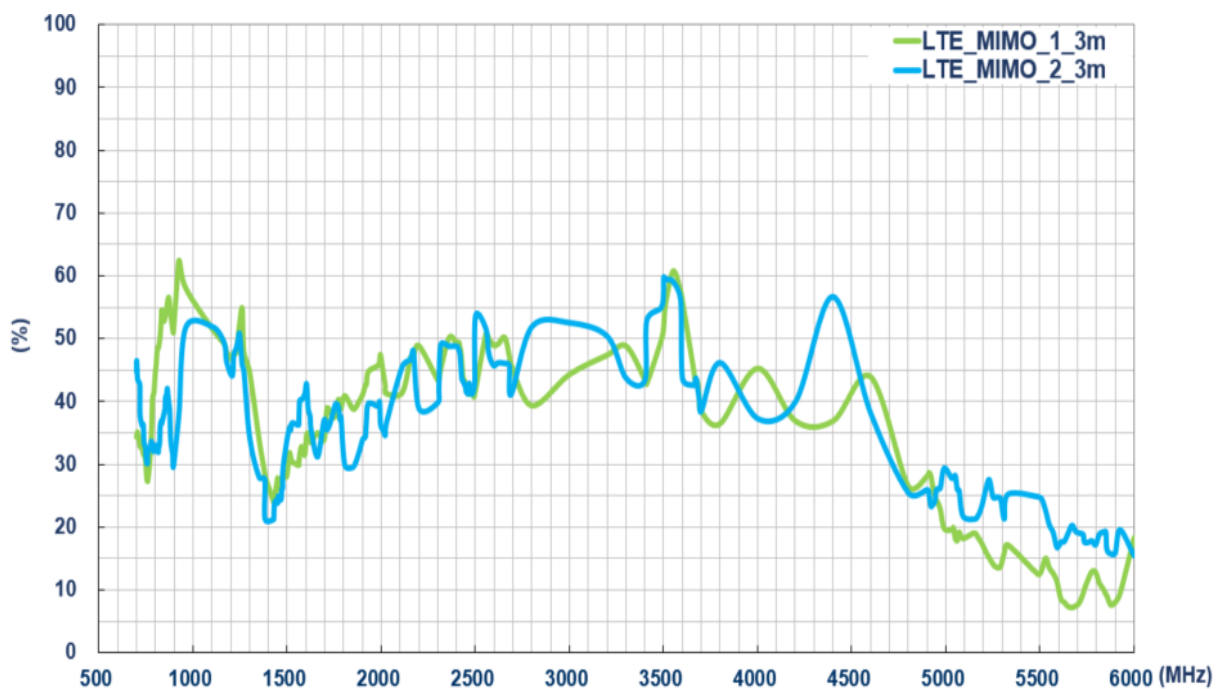
## 3. Antenna Characteristics

### 3.1. LTE MIMO1 and MIMO2 Antennas

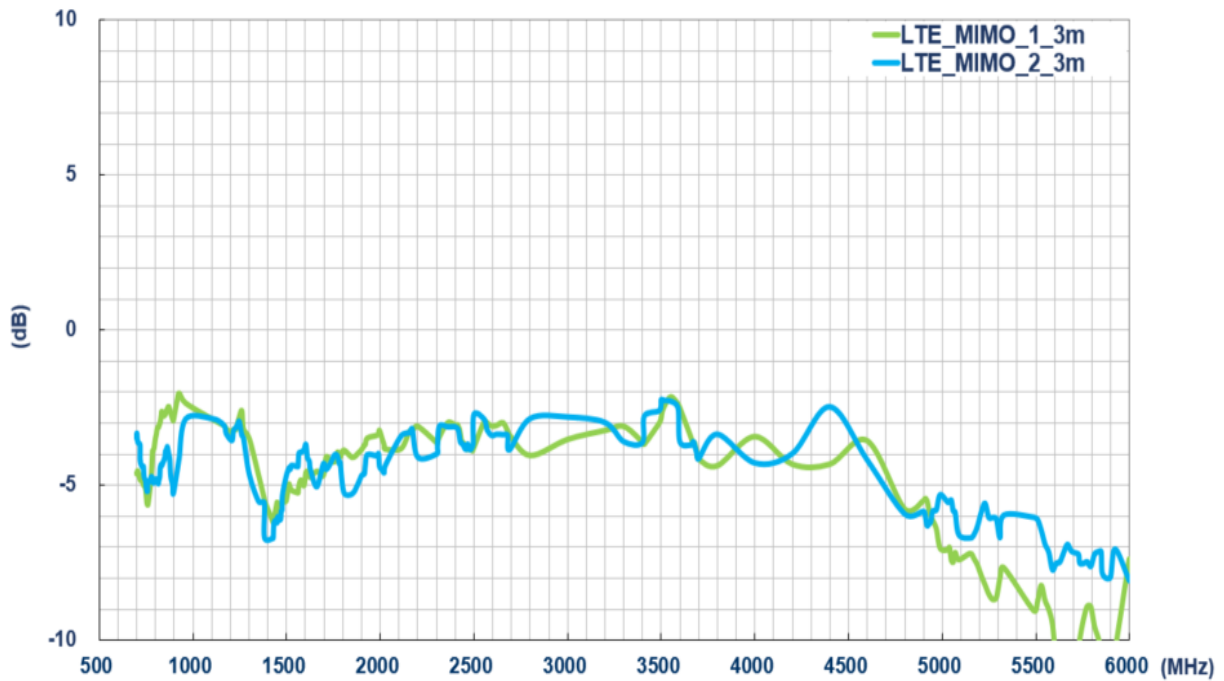
#### 3.1.1. Return Loss – LTE MIMO1 and MIMO2



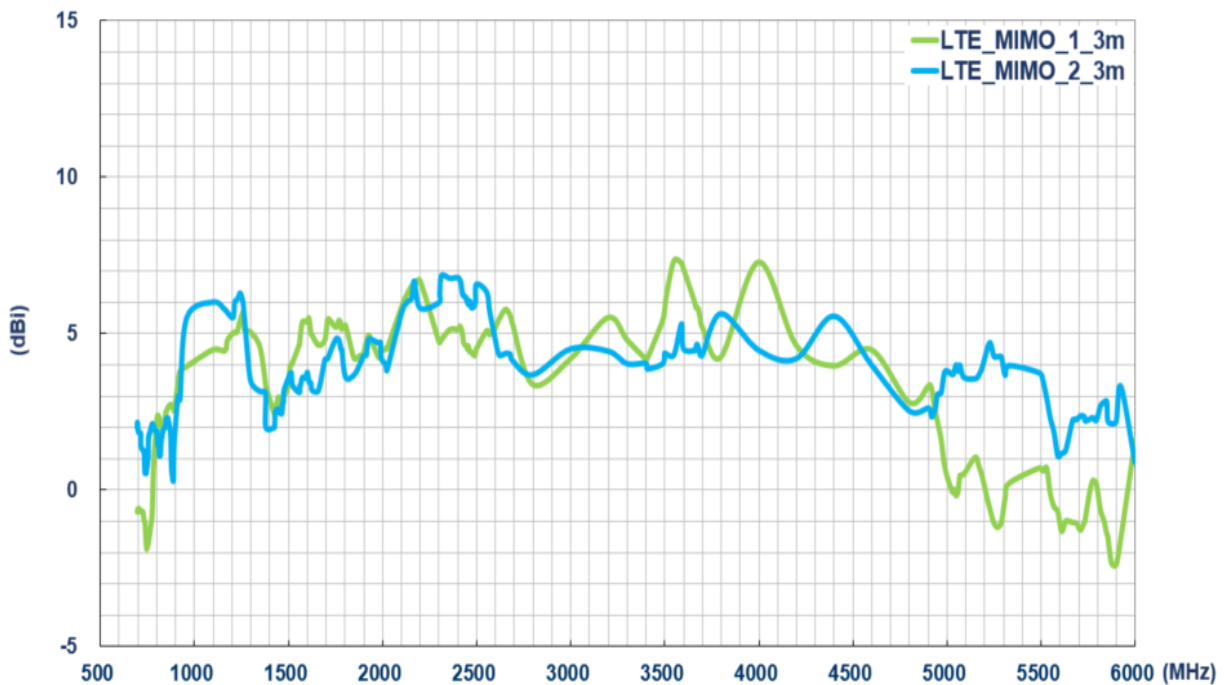
#### 3.1.2. Efficiency – LTE MIMO1 and MIMO2



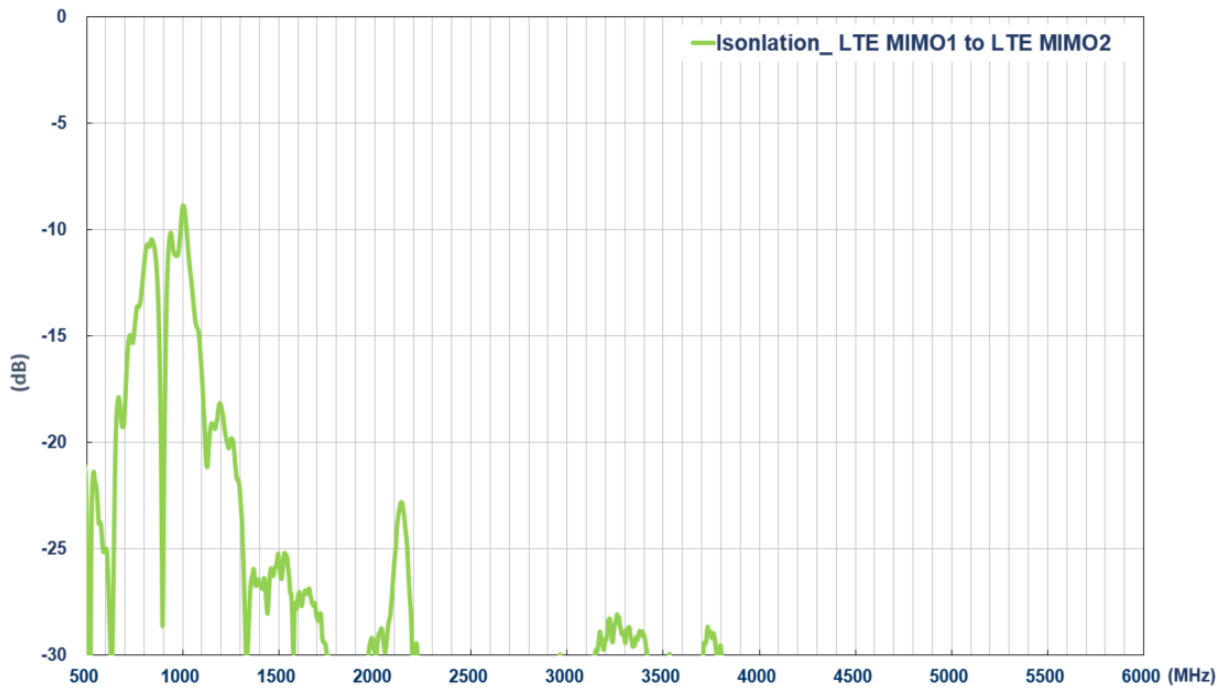
### 3.1.3. Average Gain – LTE MIMO1 and MIMO2



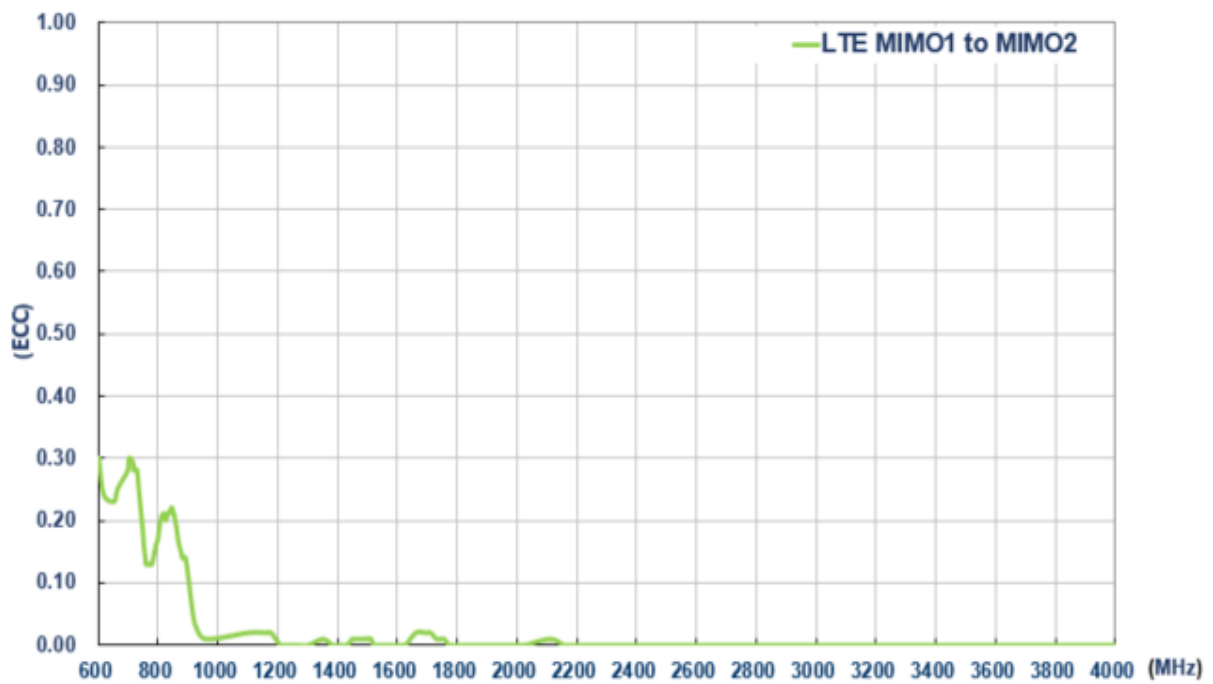
### 3.1.4. Peak Gain – LTE MIMO1 and MIMO2



### 3.1.5. Isolation – LTE MIMO1 and MIMO2

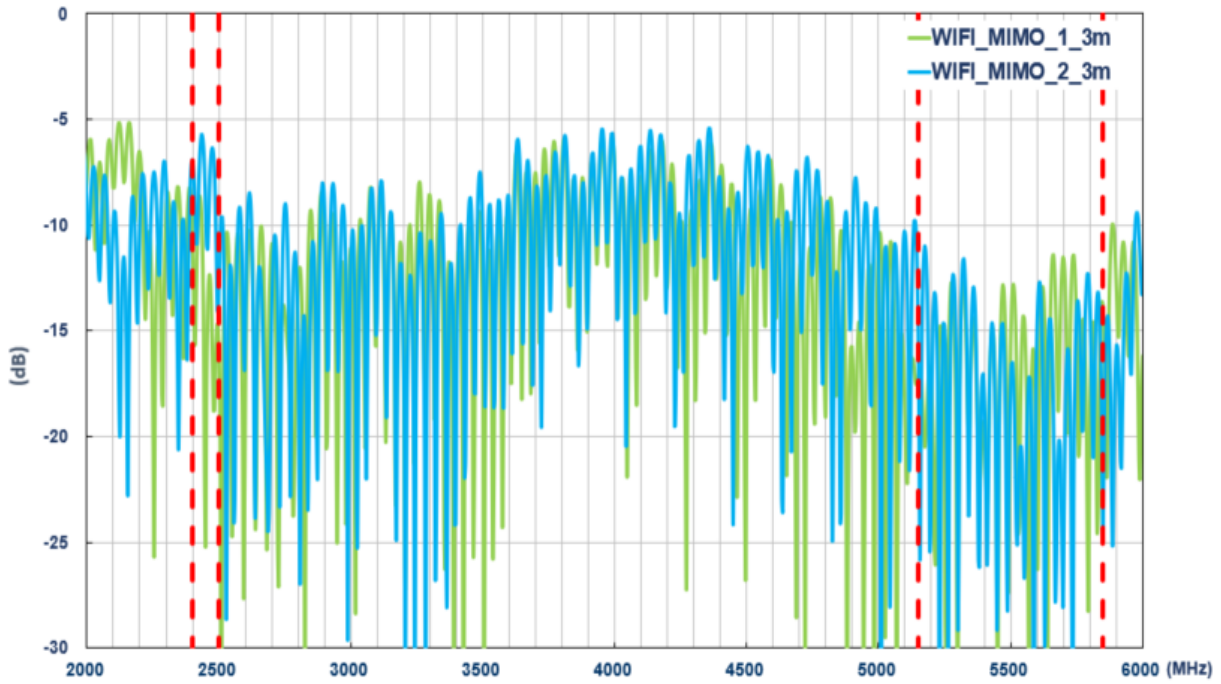


### 3.1.6. ECC – LTE MIMO1 and MIMO2

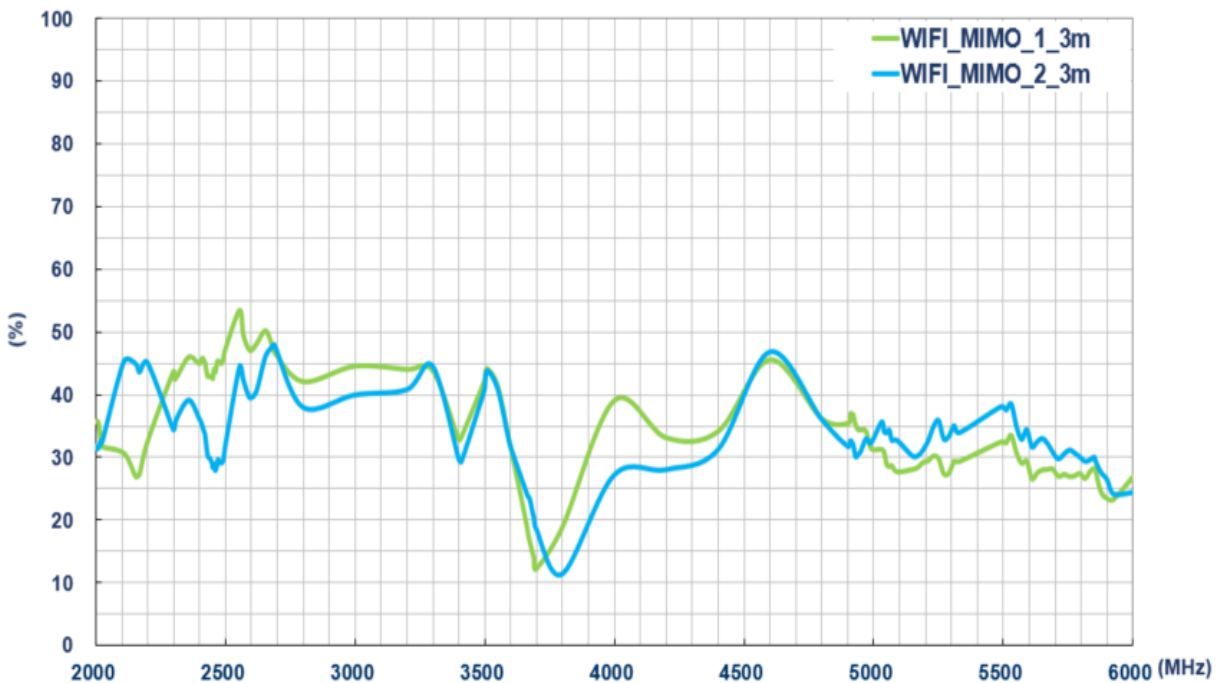


### 3.2. WI-FI MIMO1 and MIMO2 Antennas

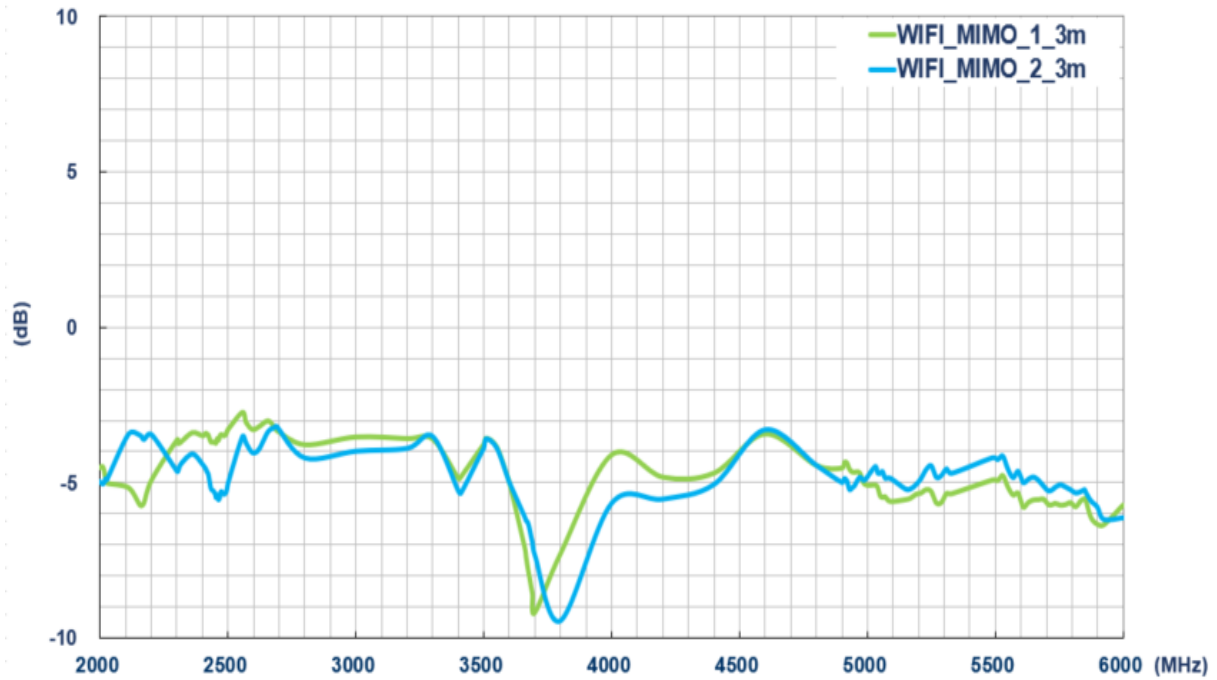
#### 3.2.1. Return Loss – WI-FI MIMO1 and MIMO2



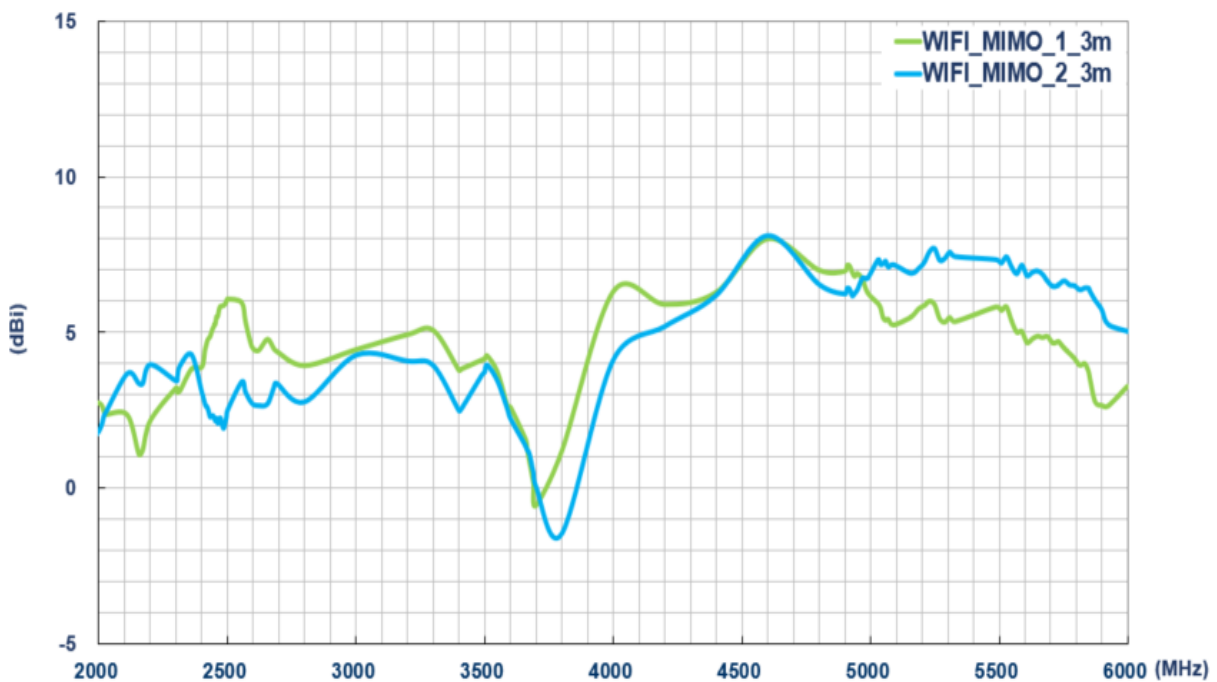
#### 3.2.2. Efficiency – WI-FI MIMO1 and MIMO2



### 3.2.3. Average Gain – WI-FI MIMO1 and MIMO2

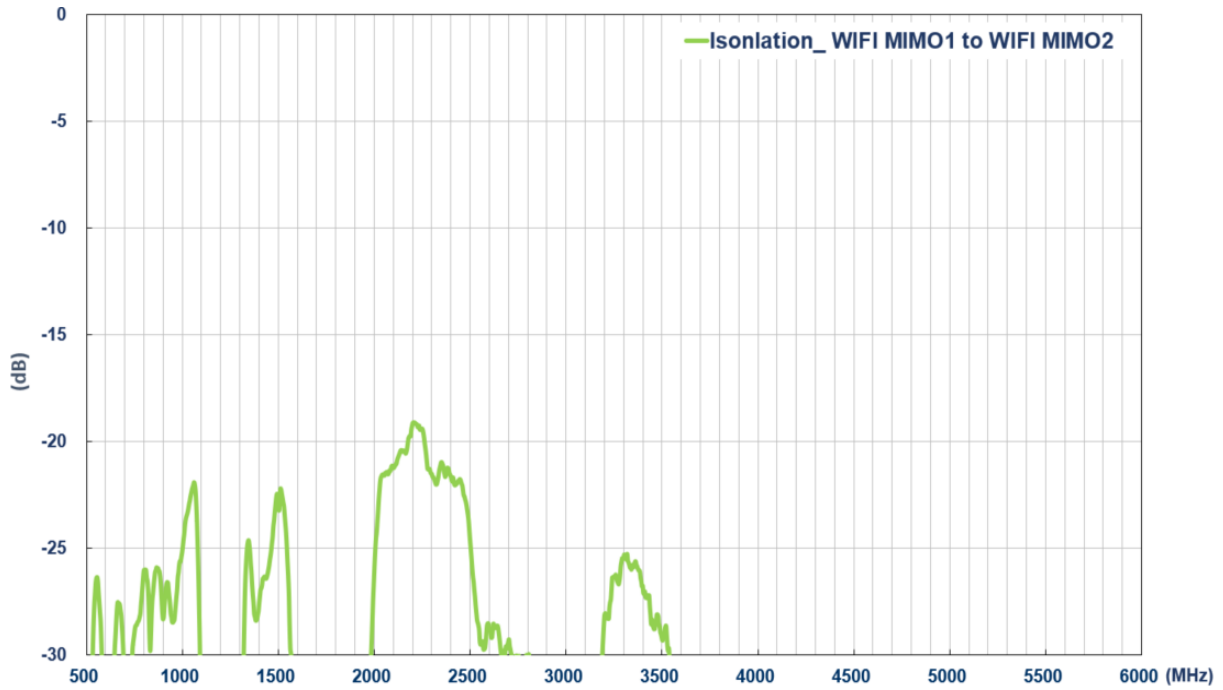


### 3.2.4. Peak Gain – WI-FI MIMO1 and MIMO2

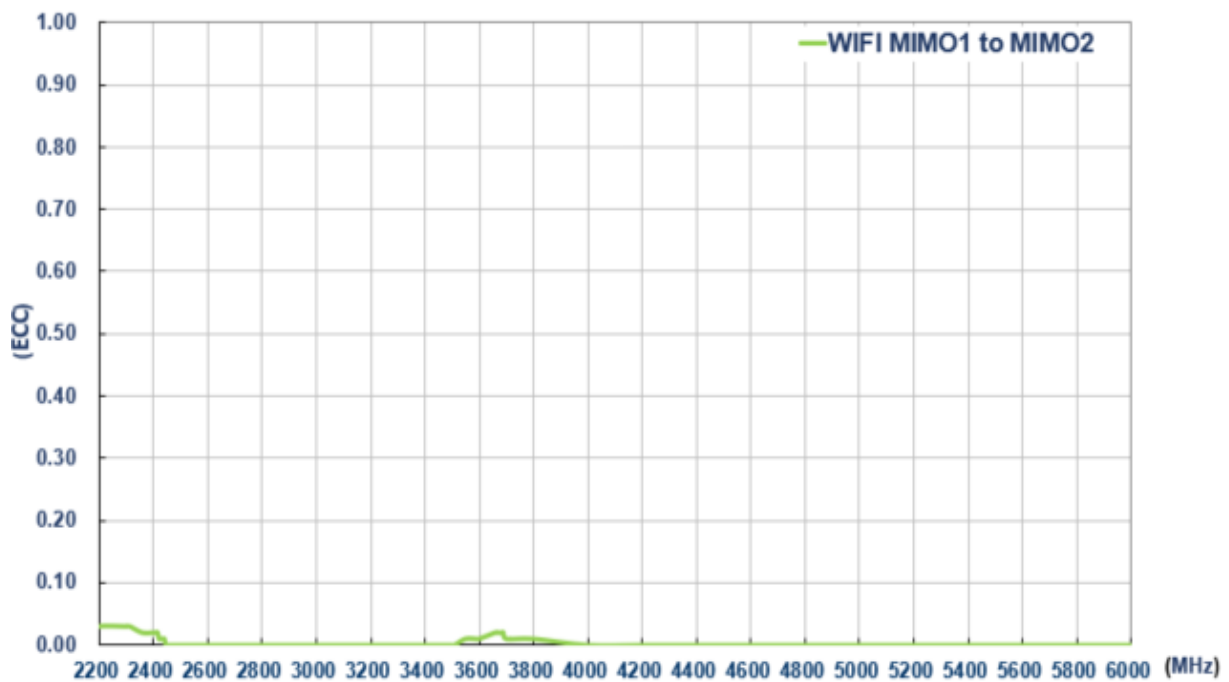




### 3.2.5. Isolation – WI-FI MIMO1 and MIMO2

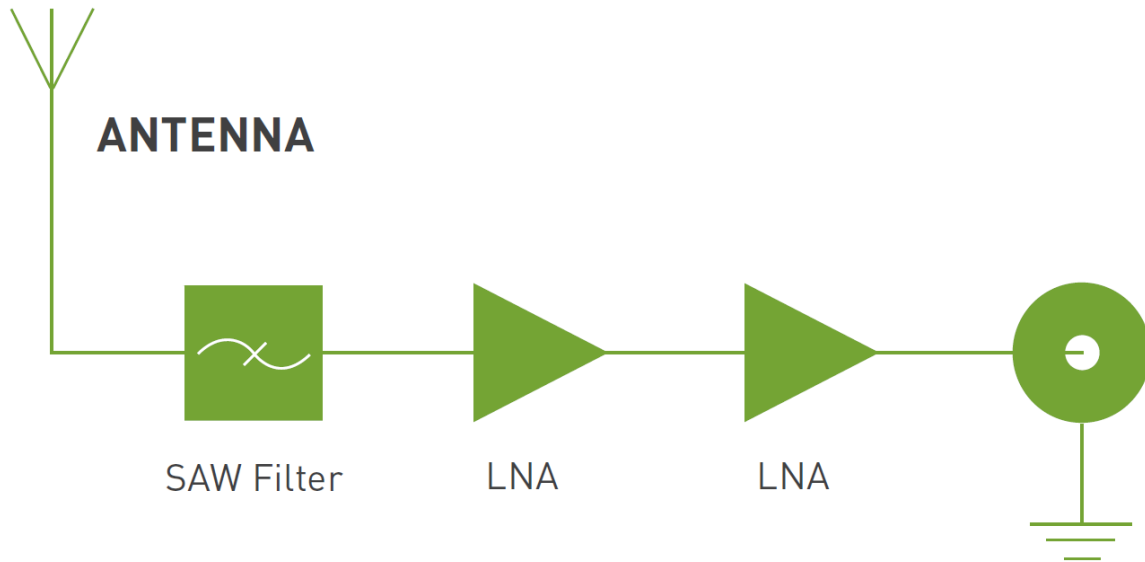


### 3.2.6. ECC – WI-FI MIMO1 and MIMO2

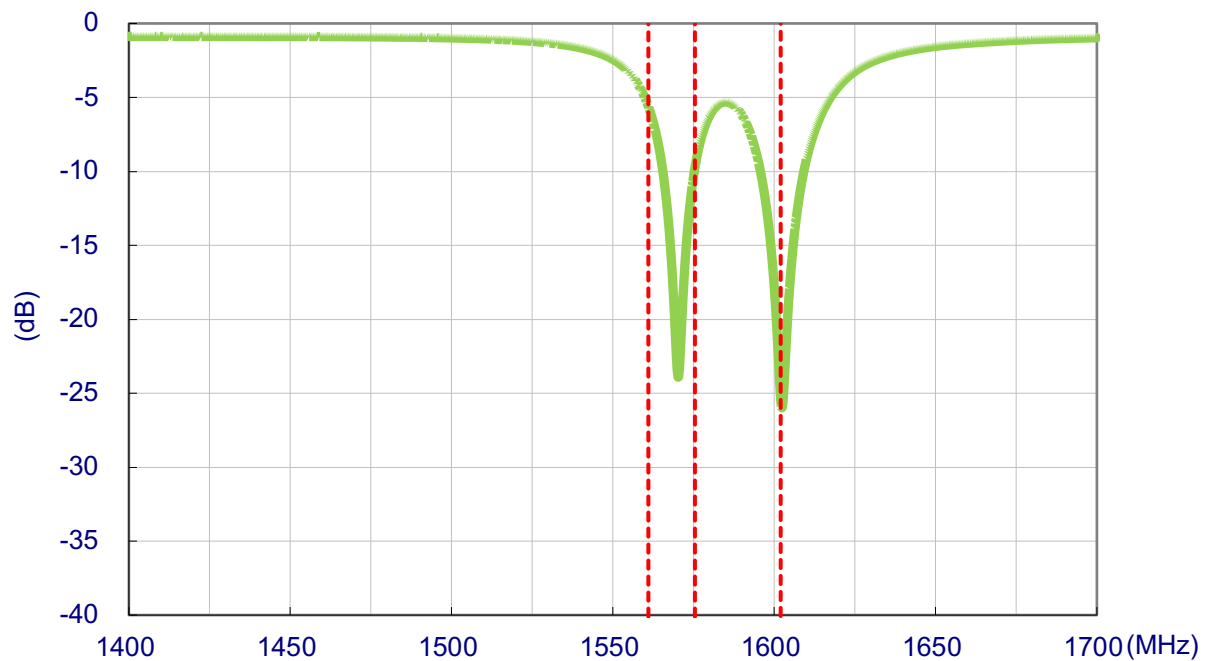


### 3.3. GNSS Antenna

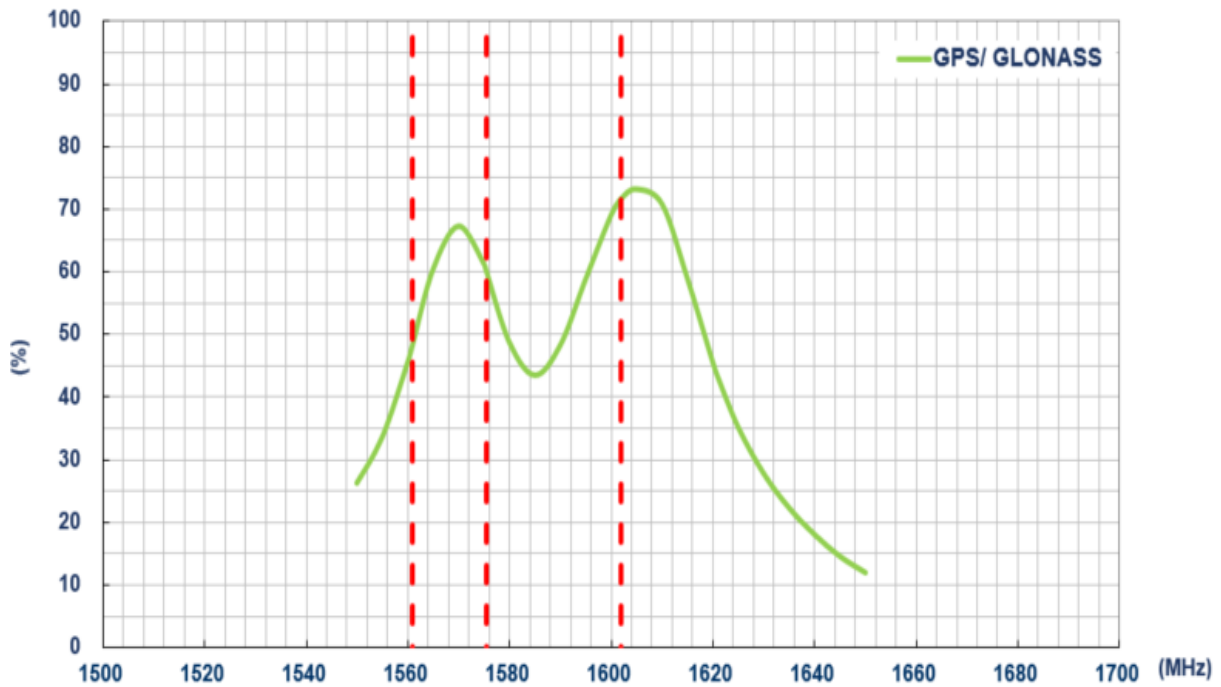
#### 3.3.1. Block Diagram (Active antenna)



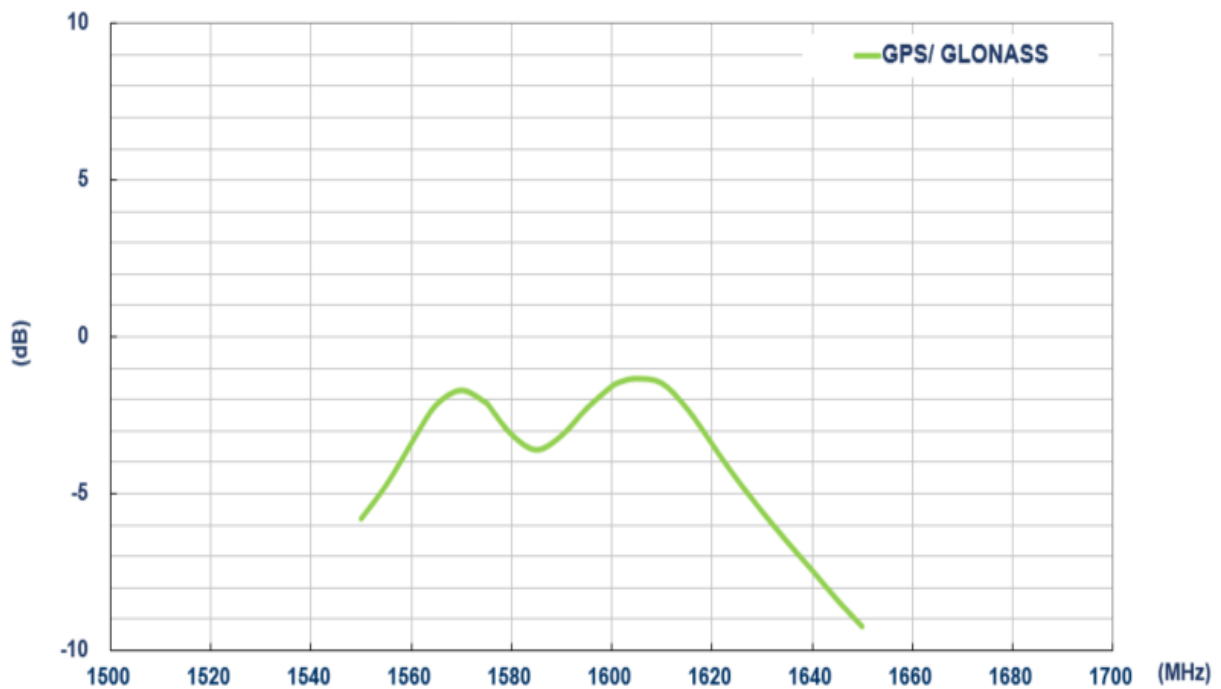
#### 3.3.2. Return Loss – GNSS Antenna



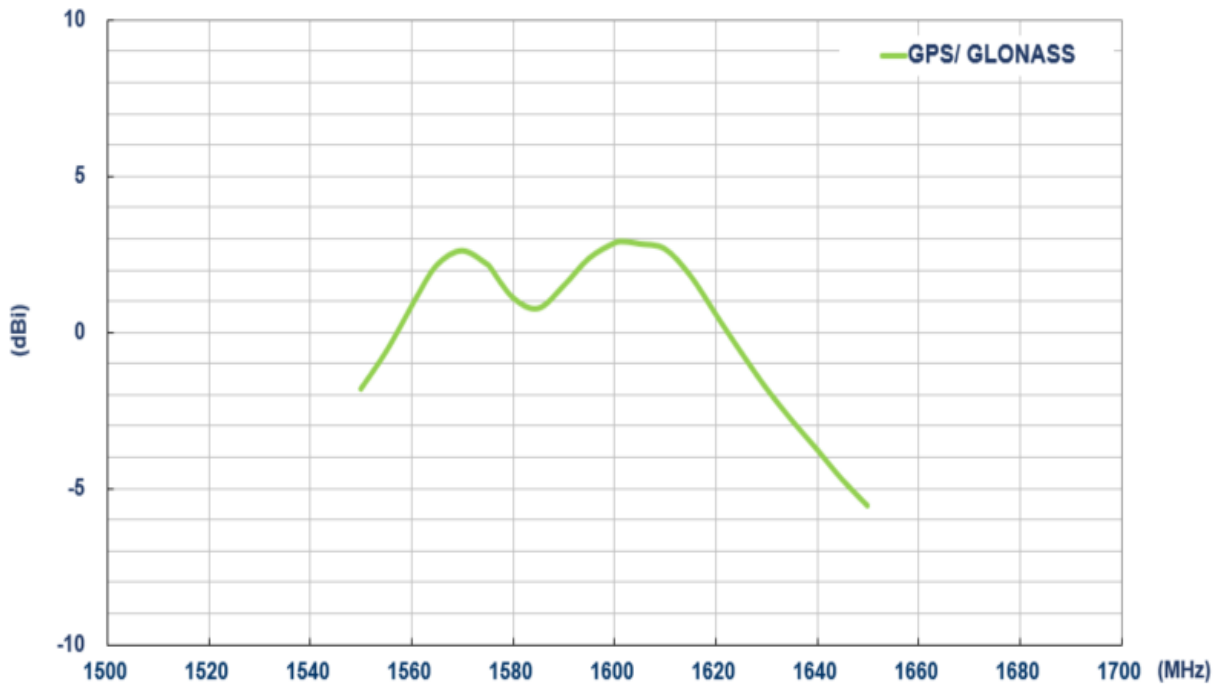
### 3.3.3. Efficiency – GNSS Antenna (passive measurement)



### 3.3.4. Average Gain – GNSS Antenna (passive measurement)

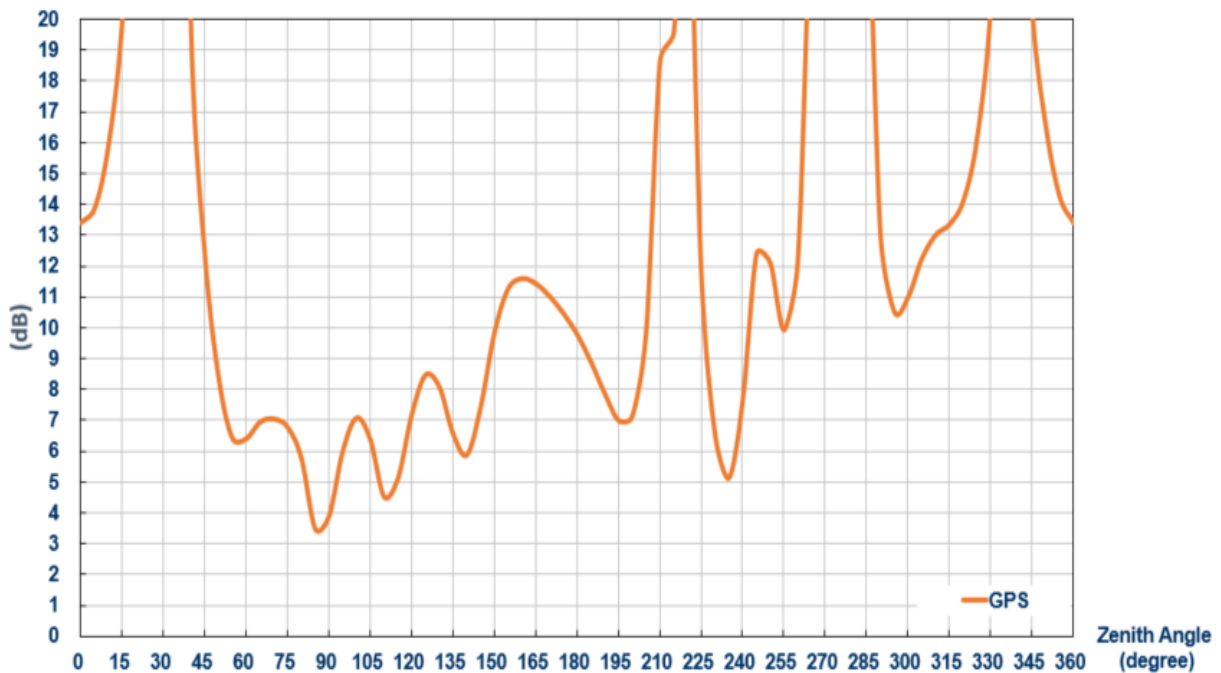


### 3.3.5. Peak Gain – GNSS Antenna (passive measurement)

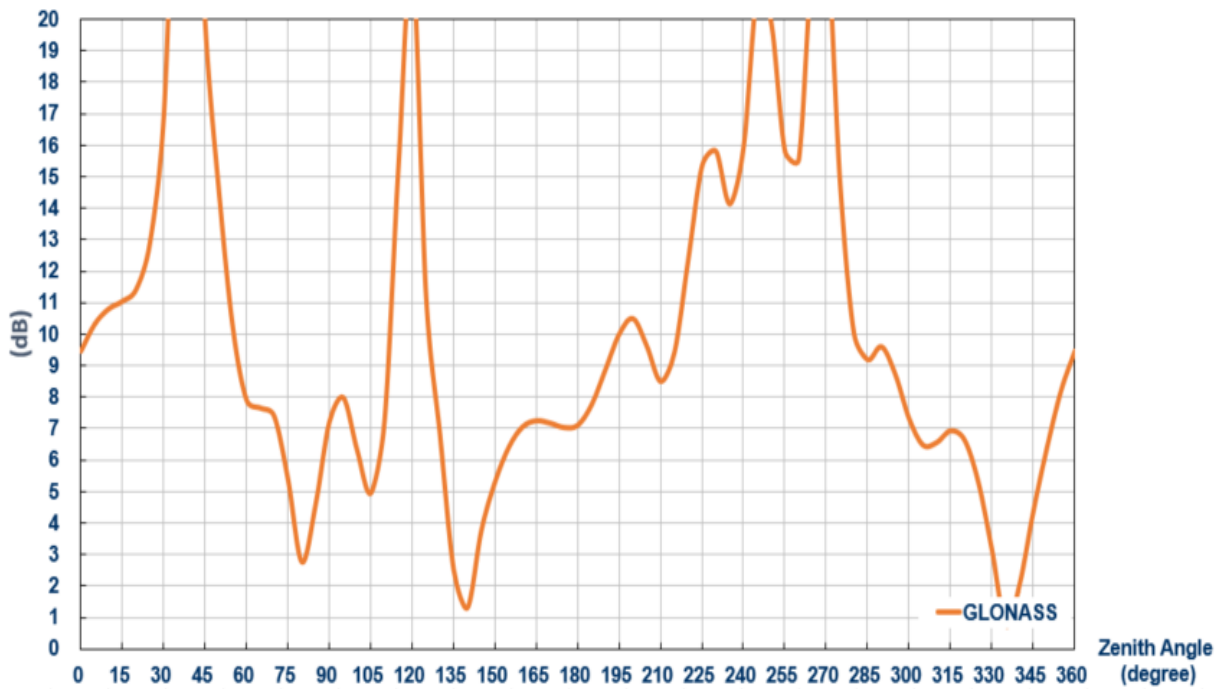


### 3.3.6. Axial Ratio – GNSS Antenna (Zenith is at 0°)

#### Axial Ratio at GPS L1 (1575.42 MHz)

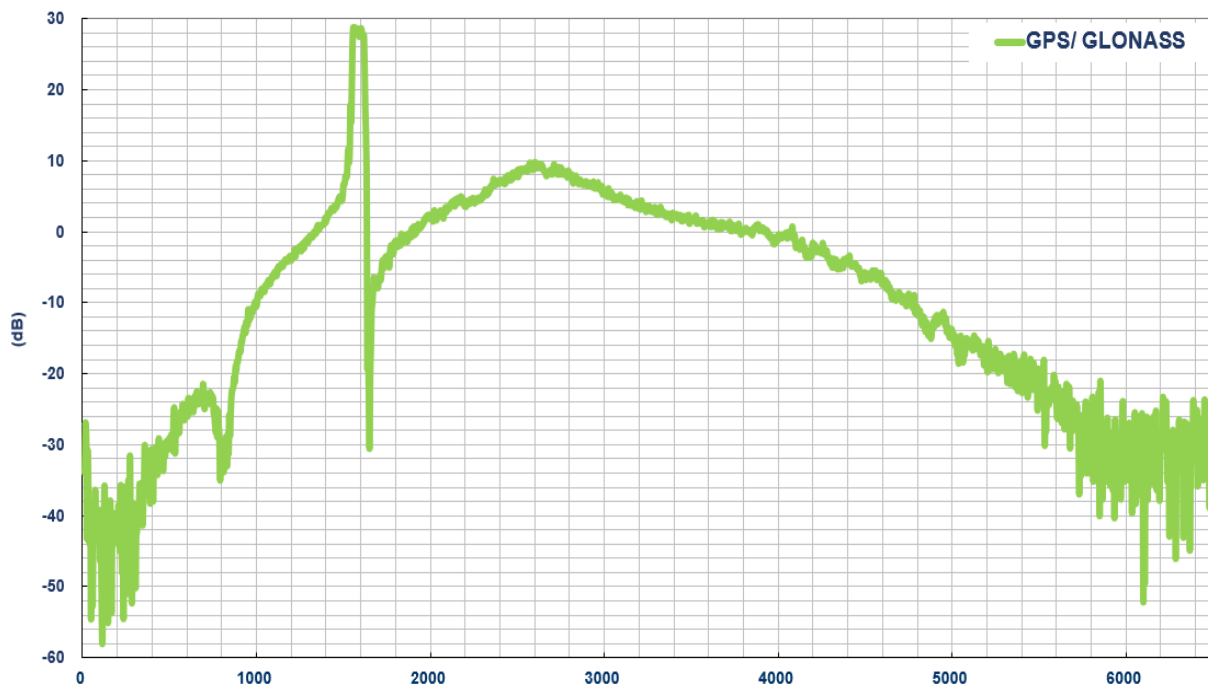


### Axial Ratio at GLONASS L1 (1602 MHz)

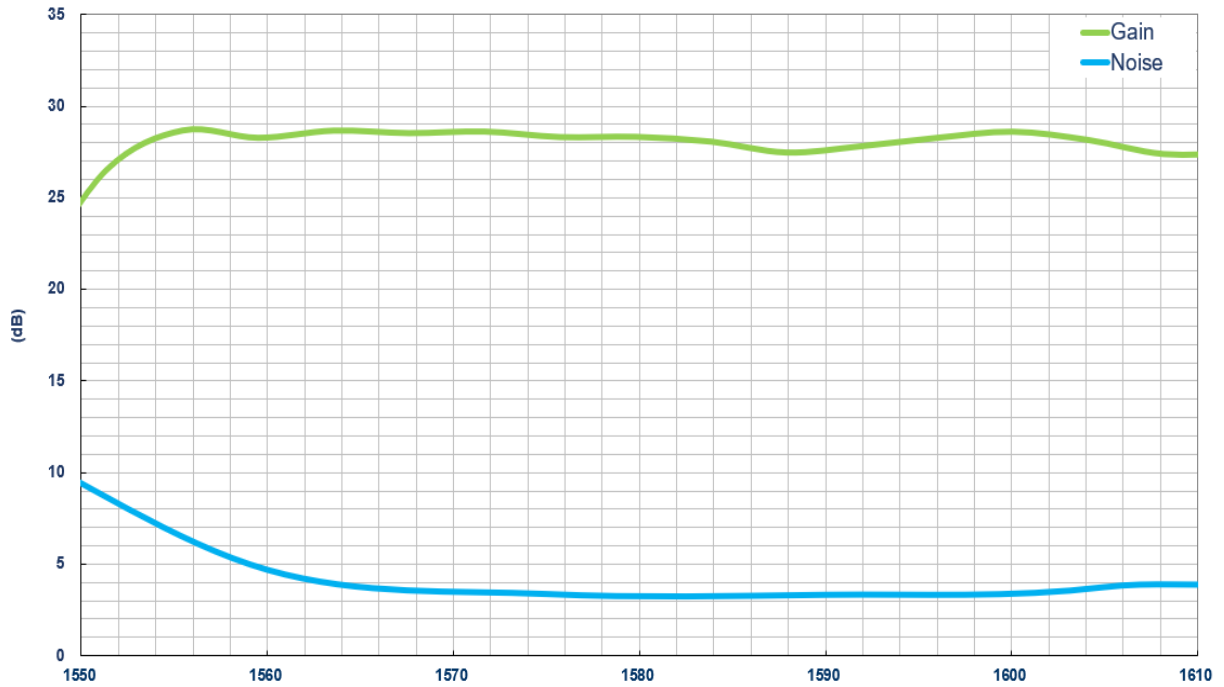


### 3.3.7. GNSS Antenna Active Measurements

#### LNA Gain @ 3.0V



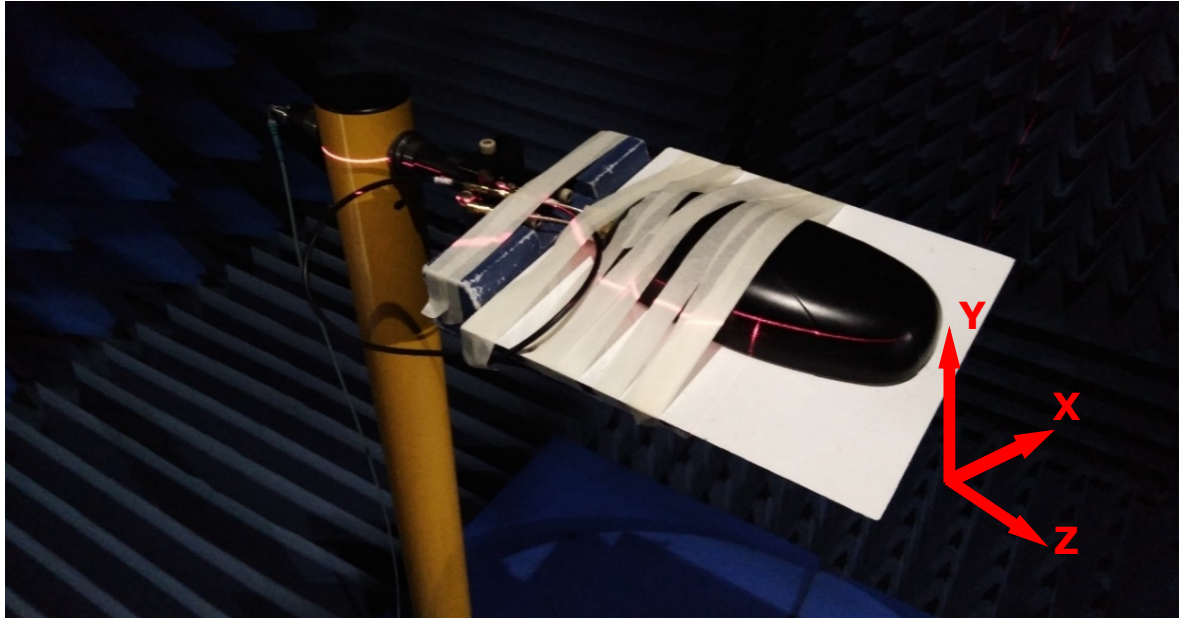
### LNA Gain and Noise Figure @ 3.0V



## 4. Antenna Radiation Patterns

### 4.1 Antenna Setup

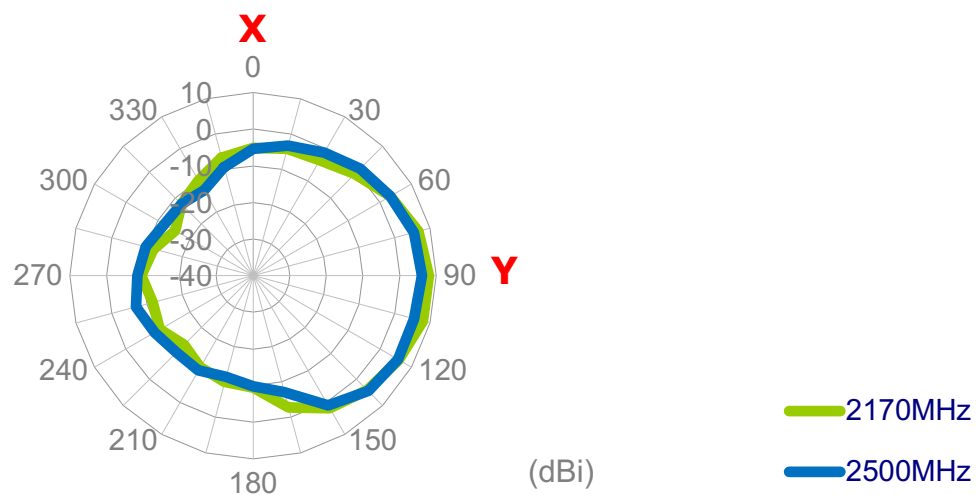
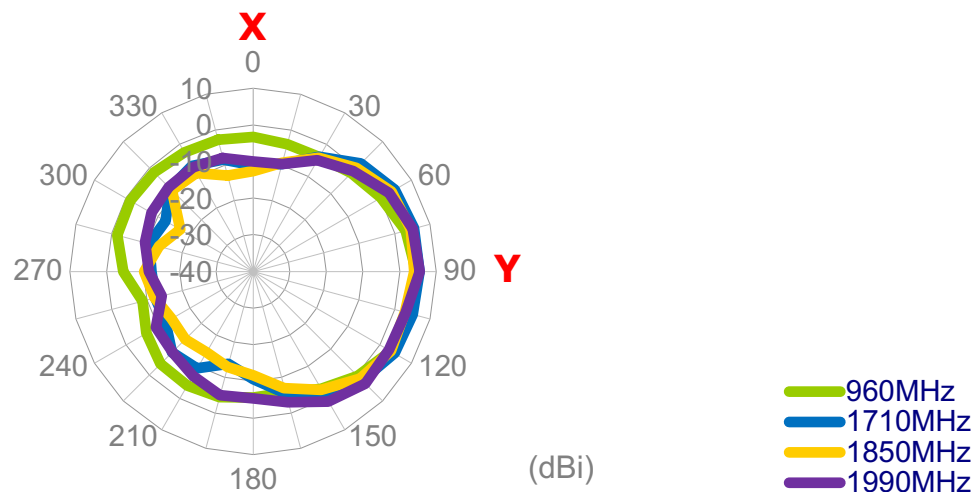
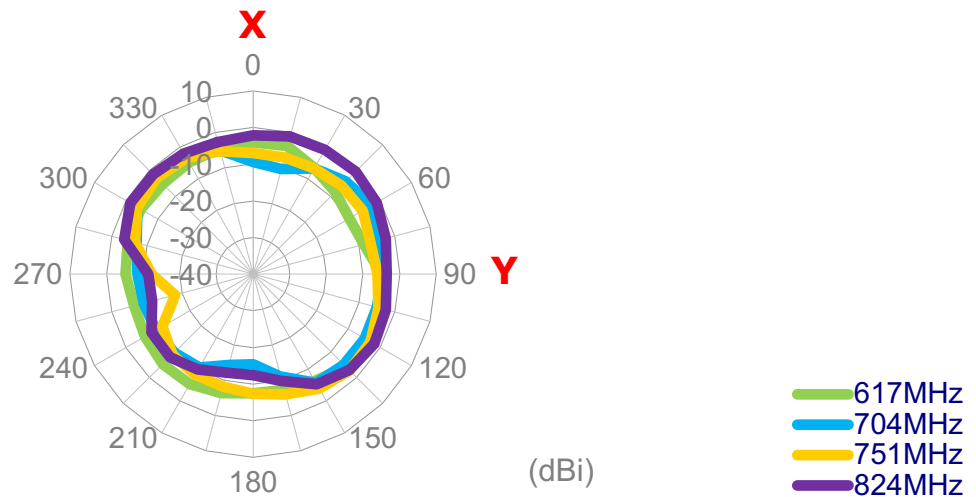
On 30\*30cm GND



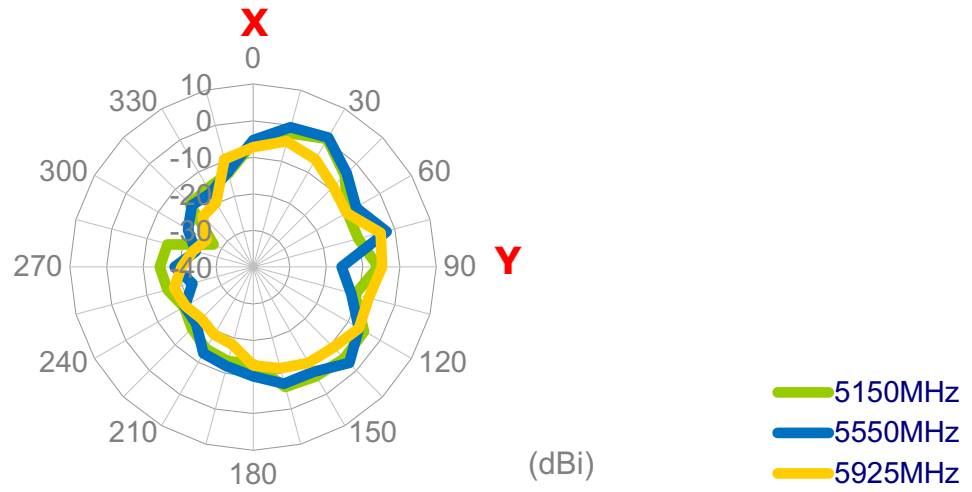
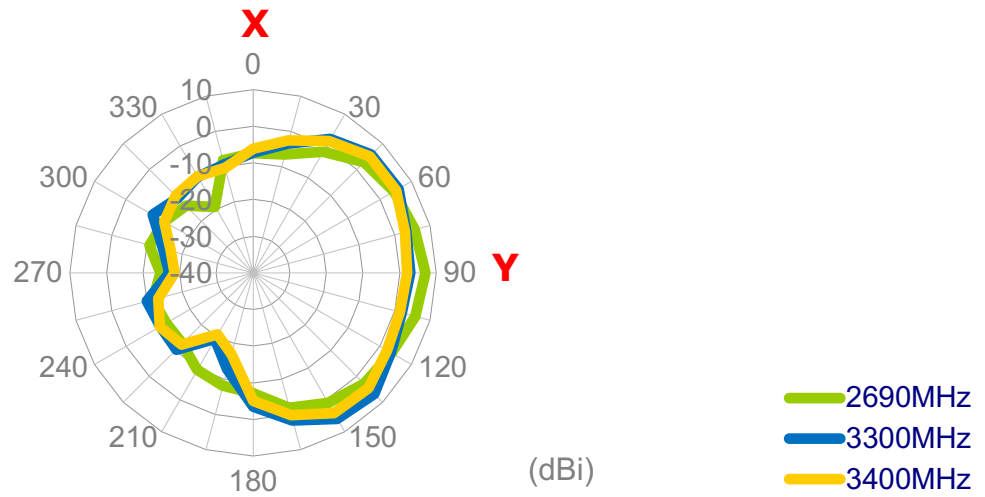
## 4.2 2D Radiation Patterns

### 4.2.1 LTE MIMO1\_On 30x30cm GND

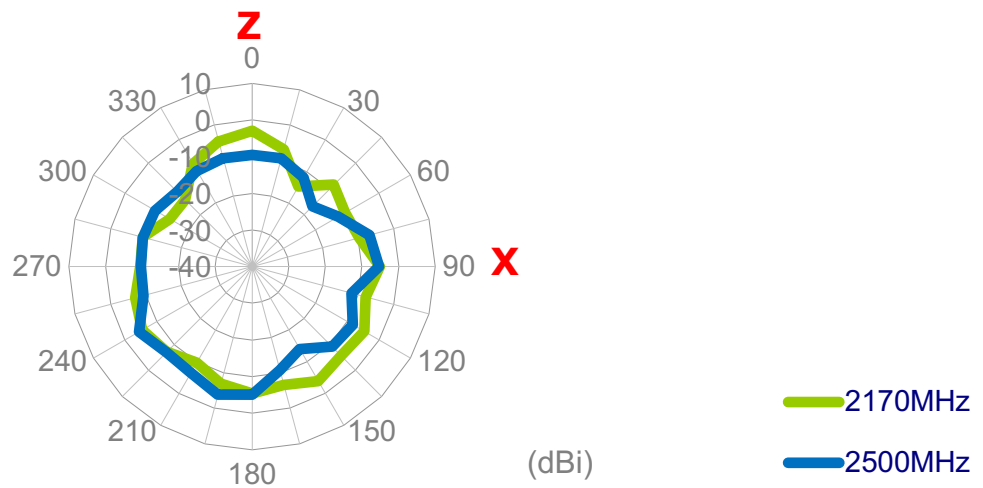
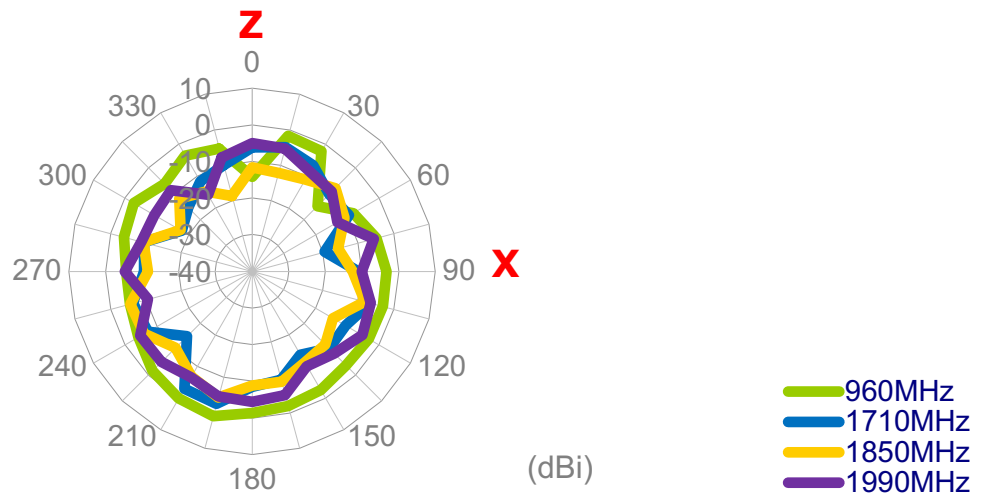
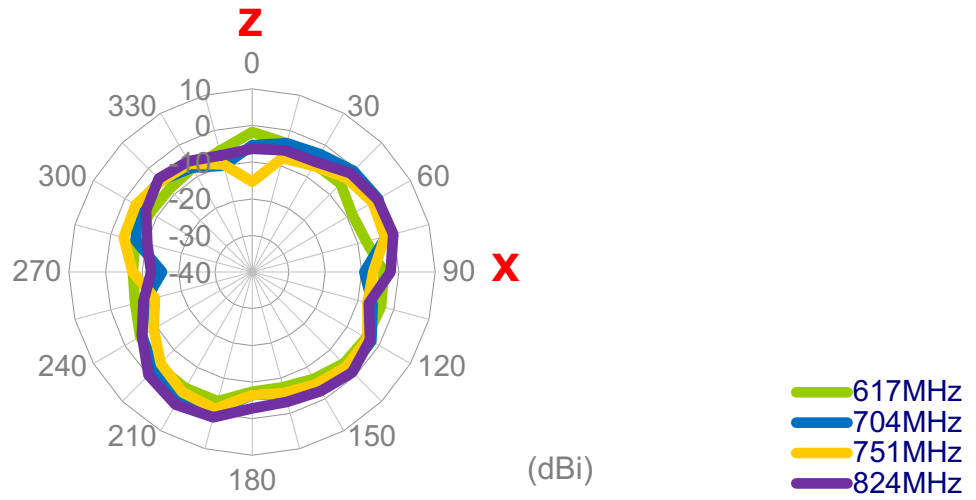
#### XY Plane

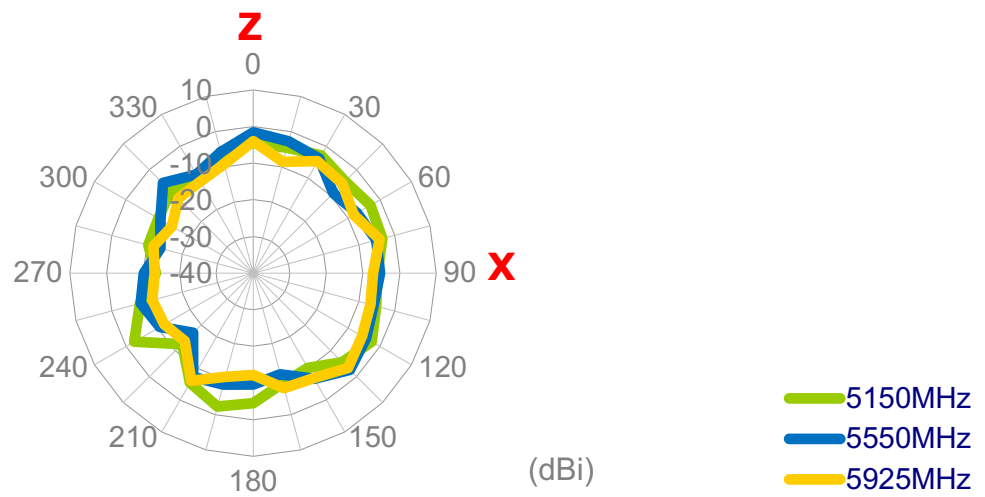
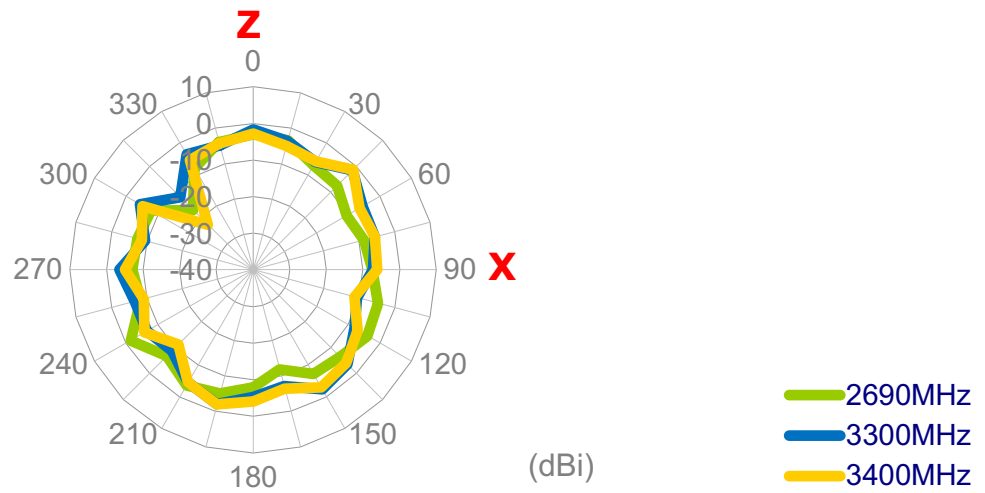




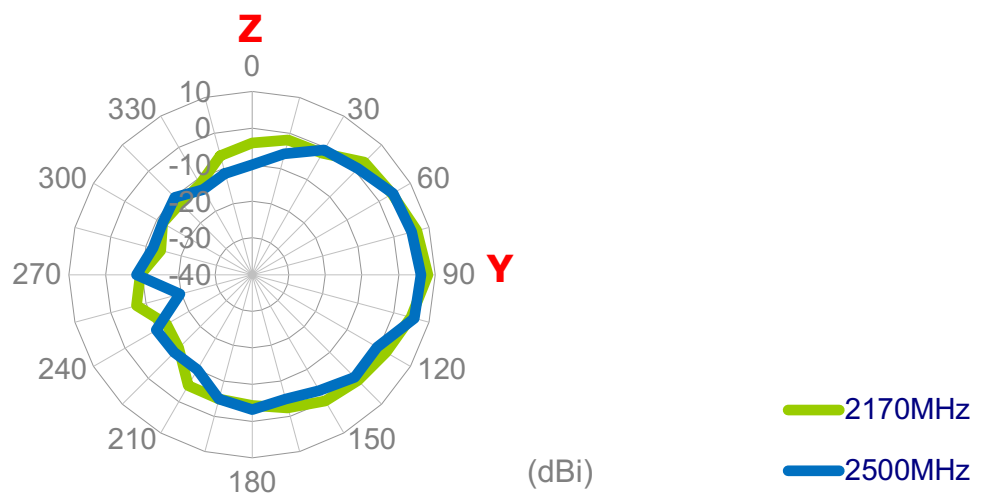
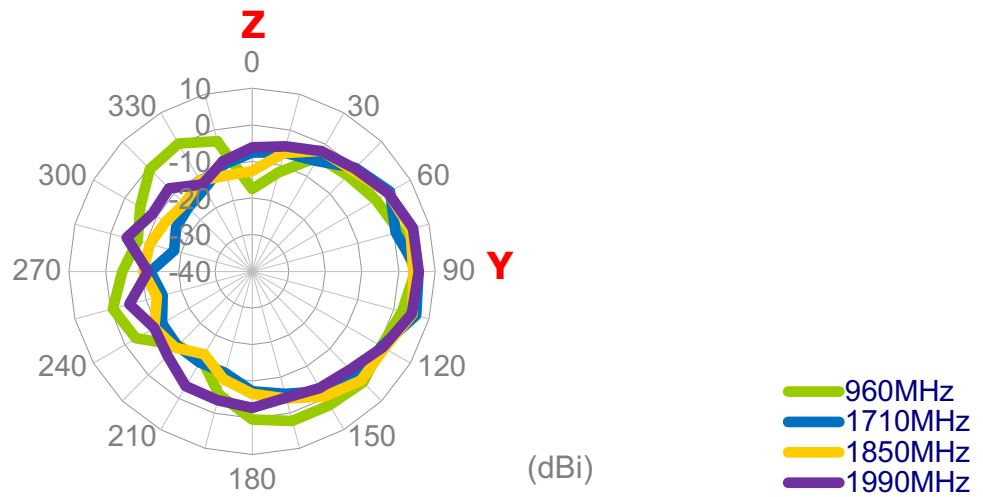
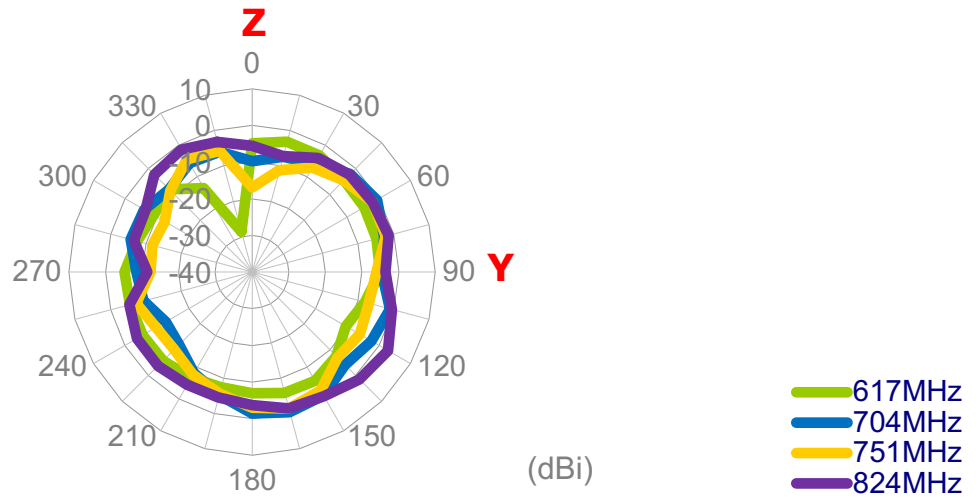


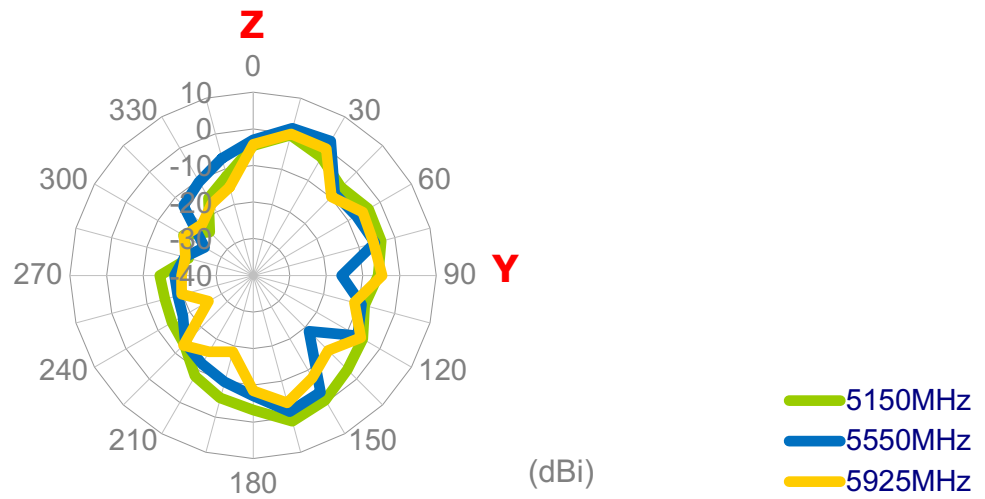
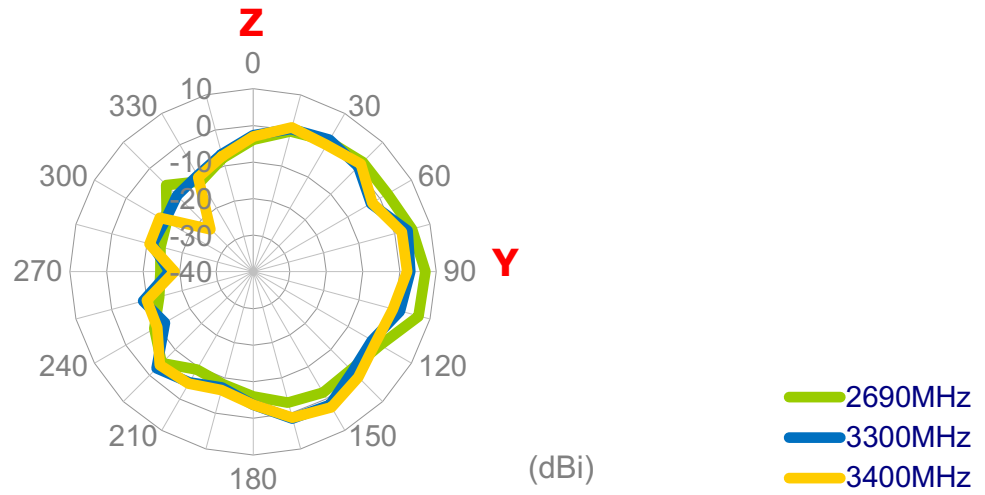
**XZ Plane**





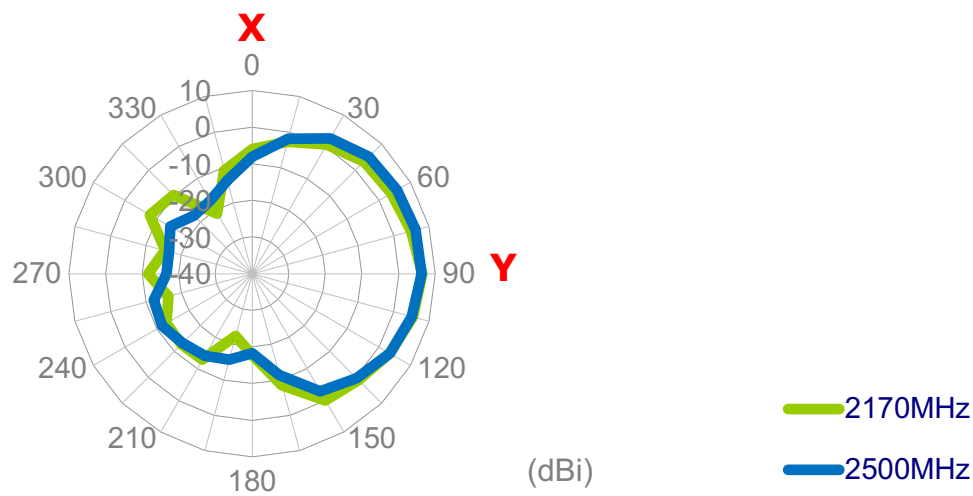
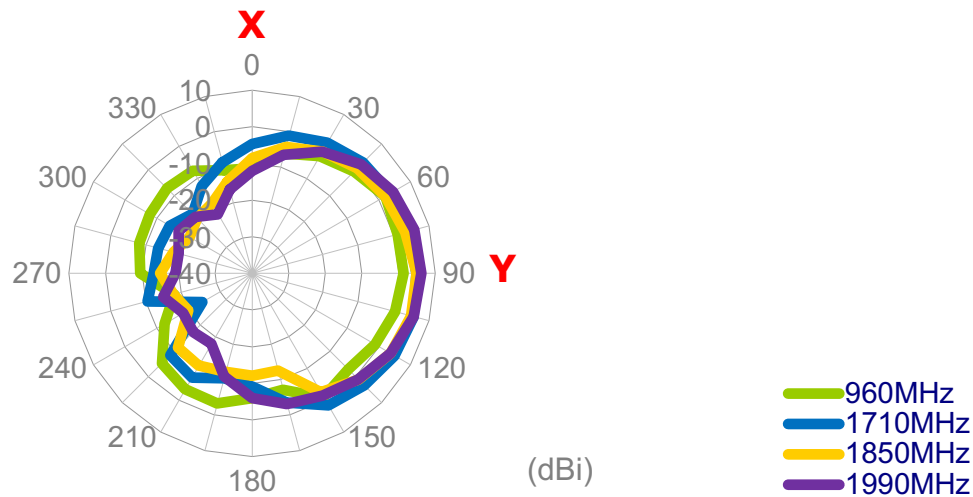
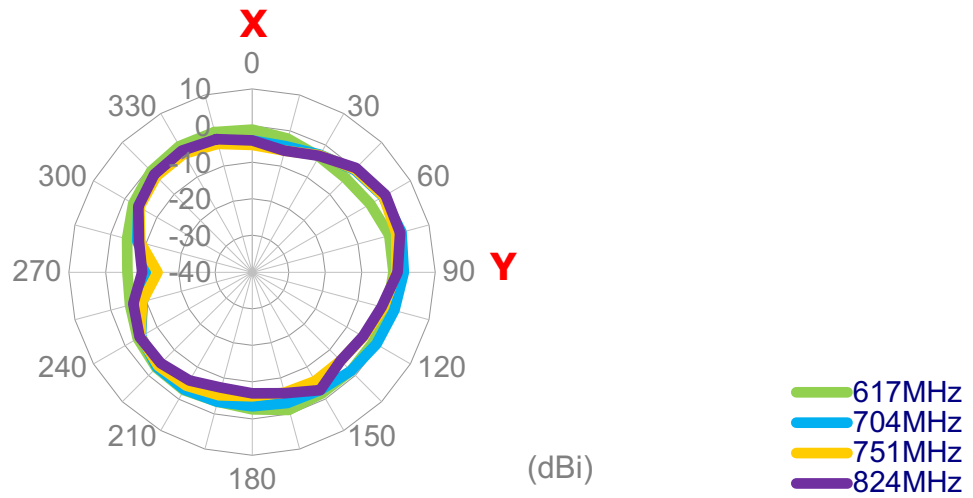
**YZ Plane**

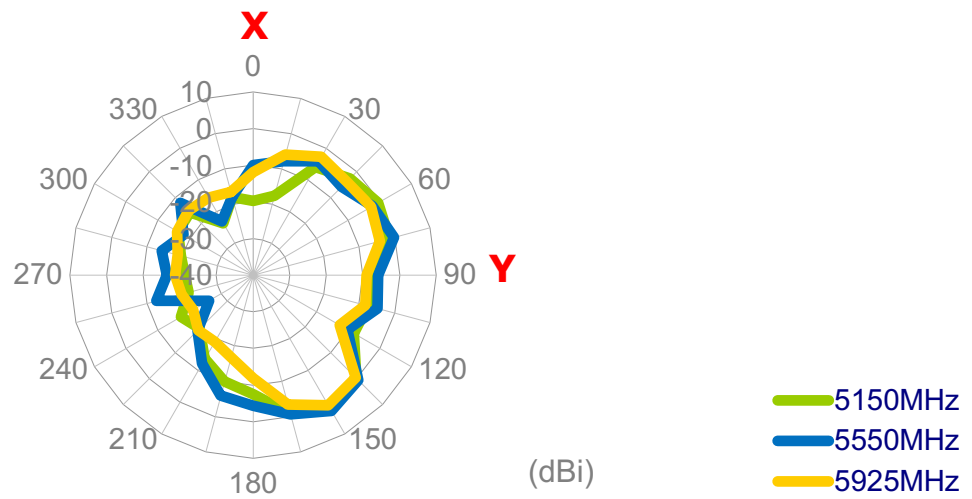
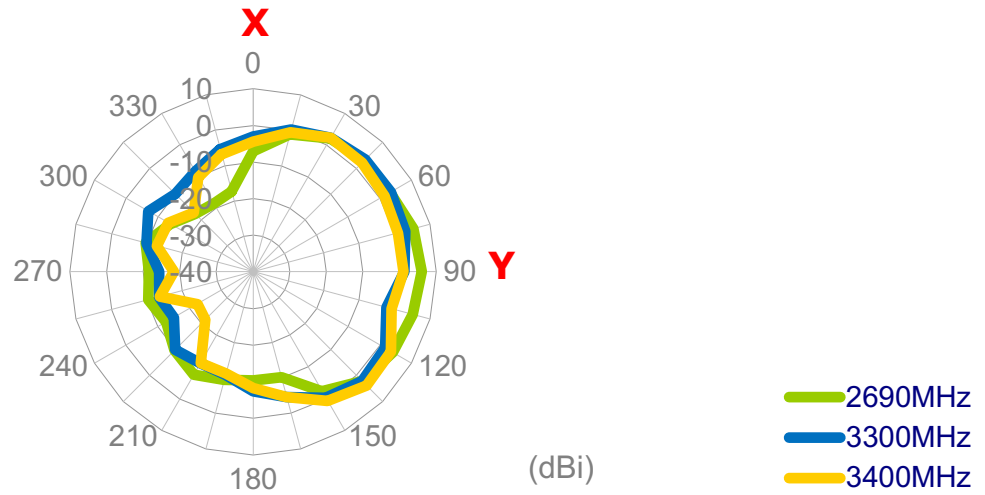




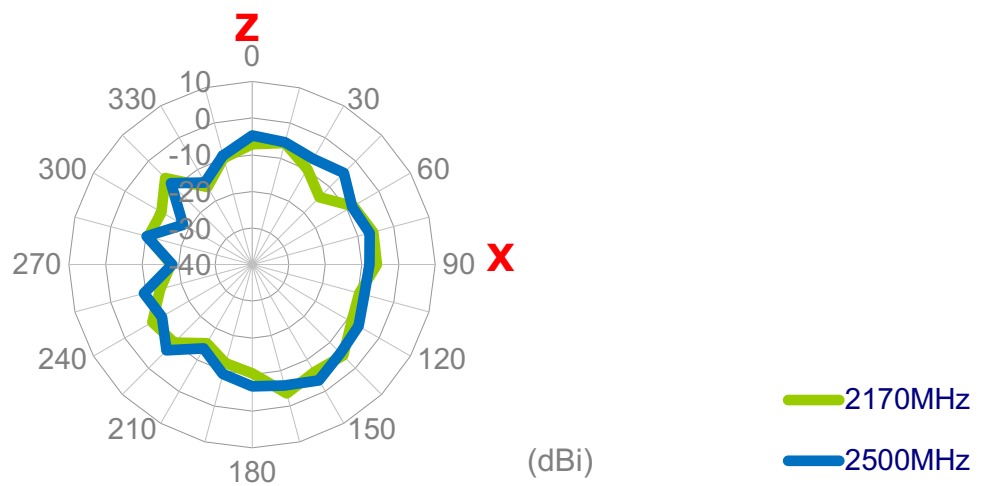
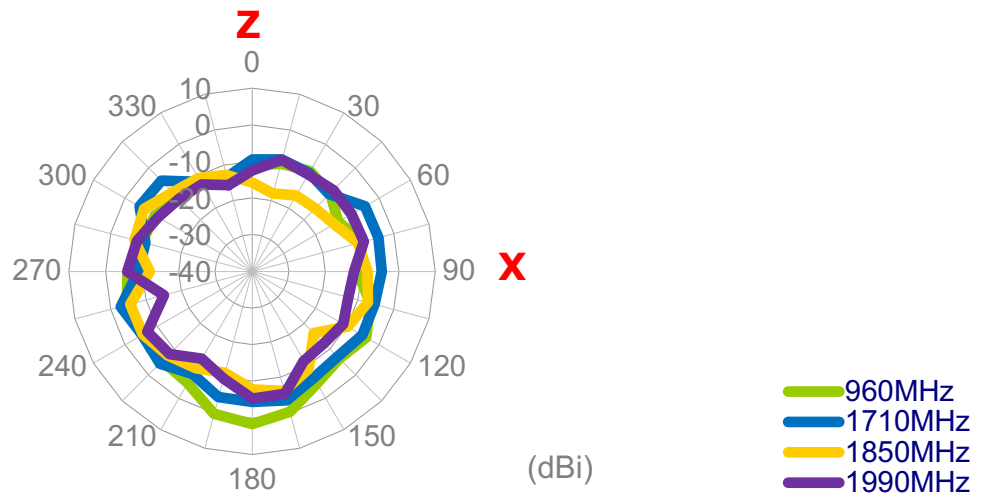
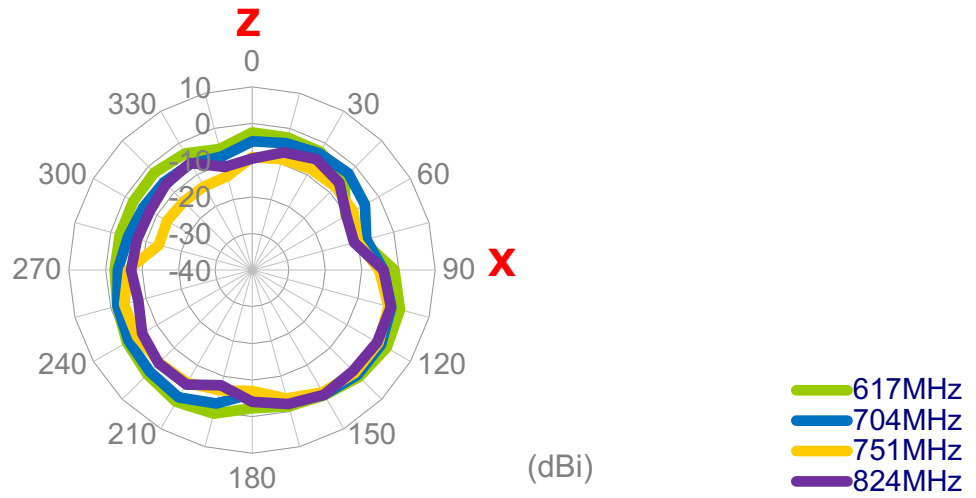
### 4.2.2 LTE MIMO2\_On 30x30cm GND

#### XY Plane

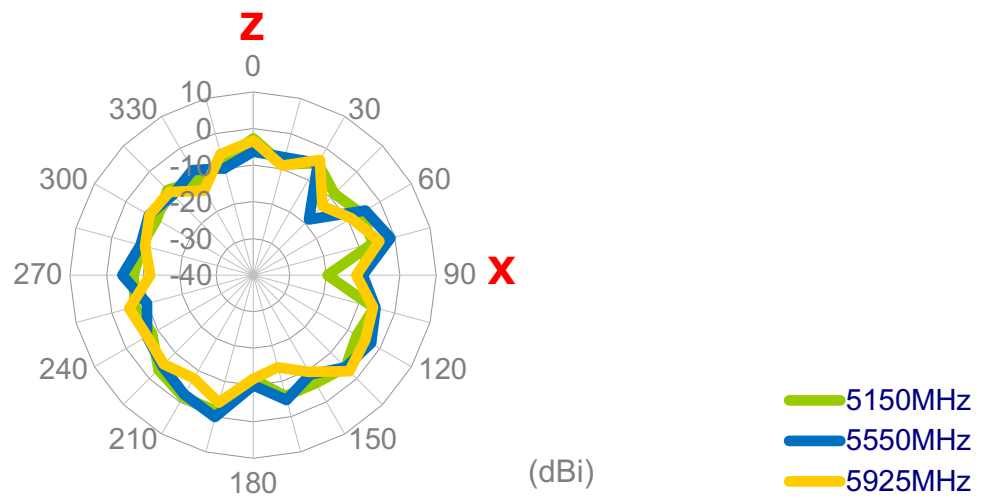
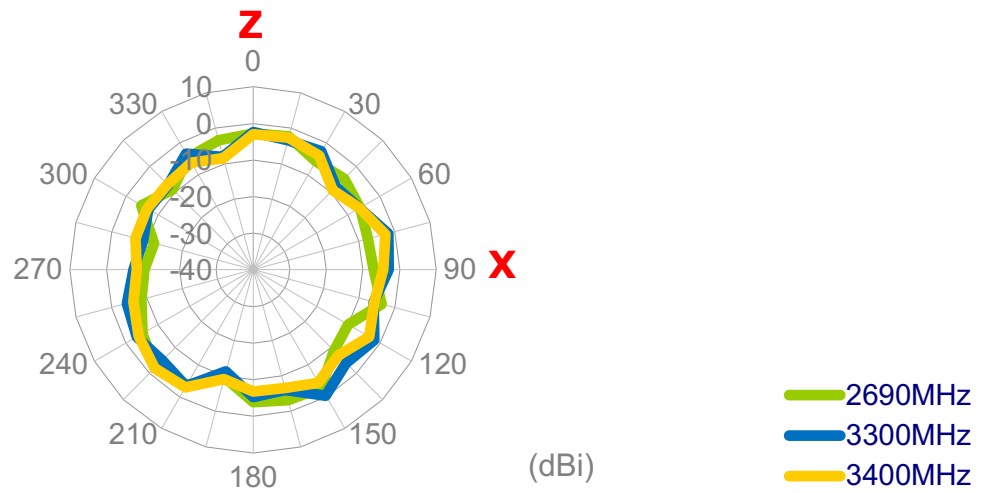




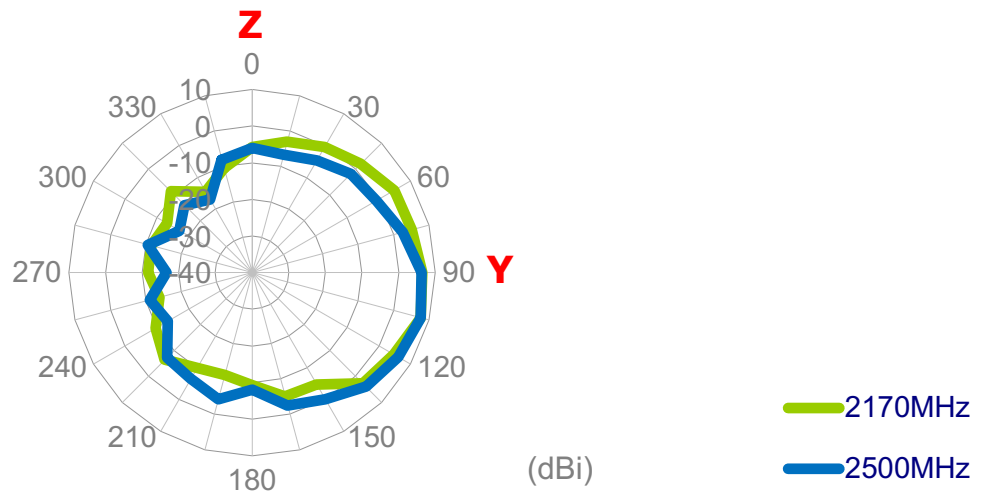
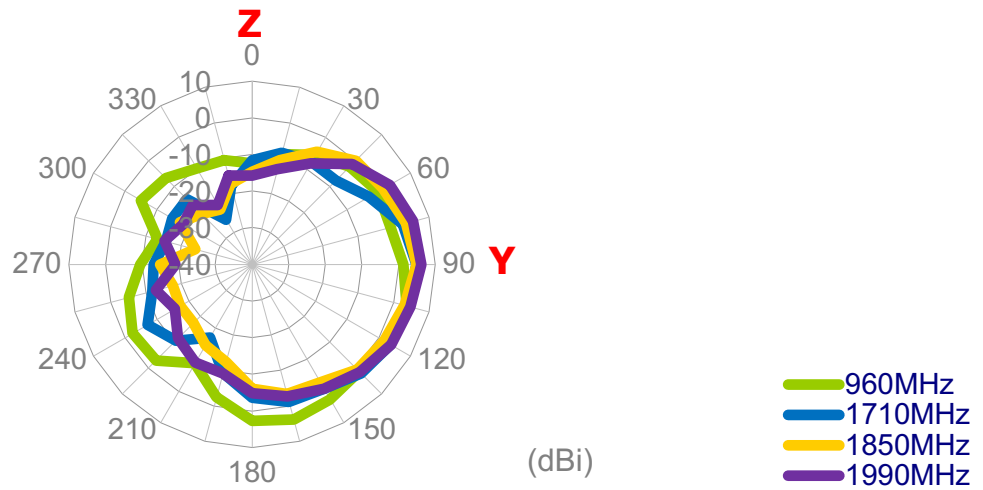
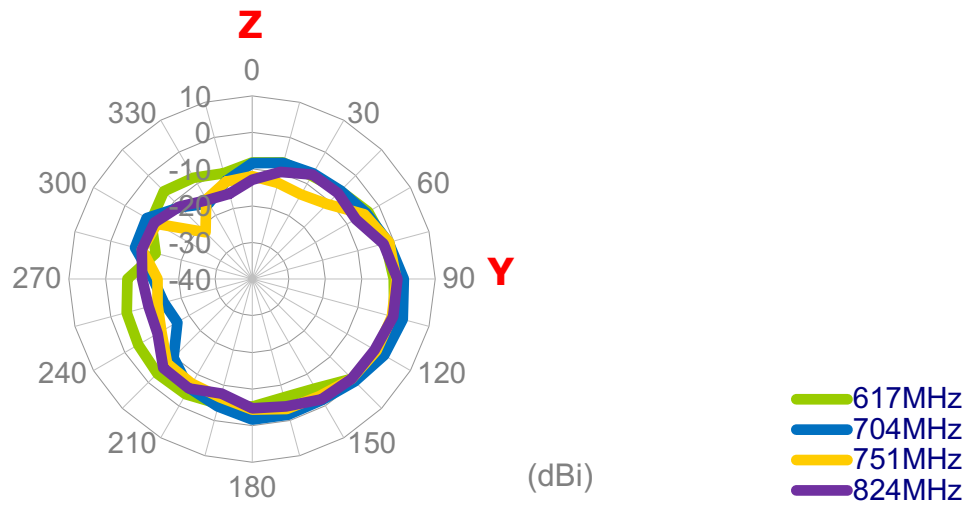
**XZ Plane**

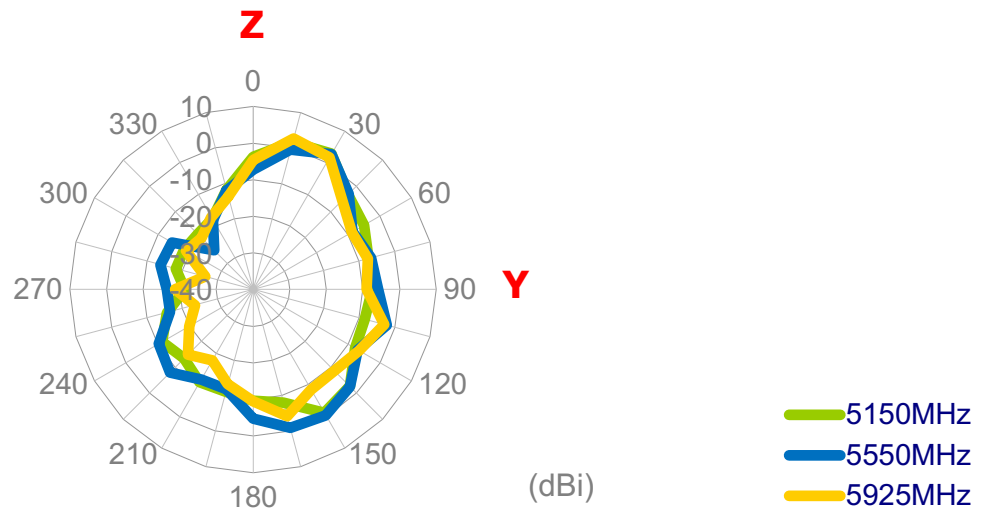
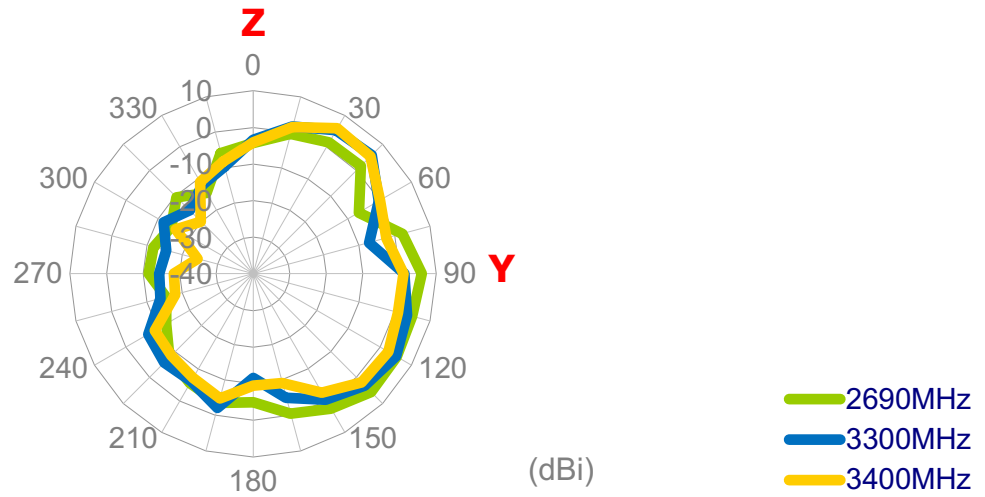






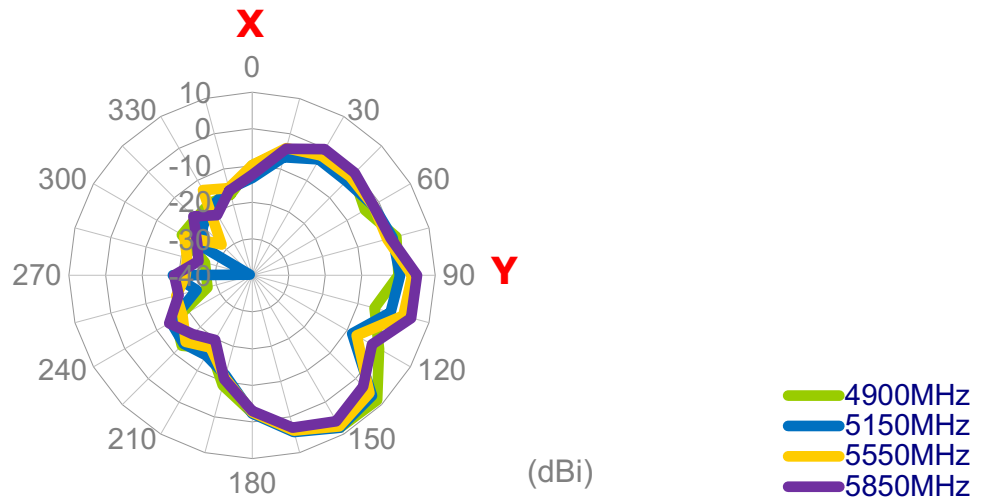
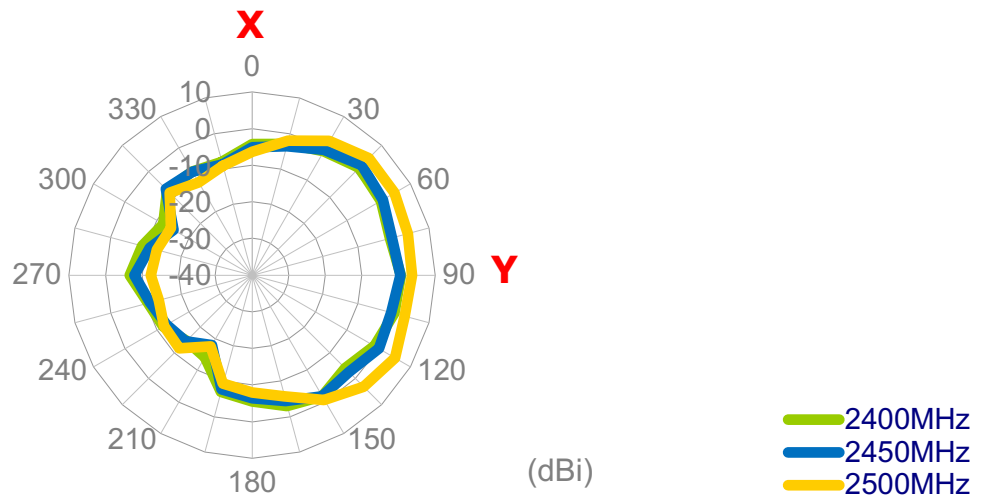
**YZ Plane**



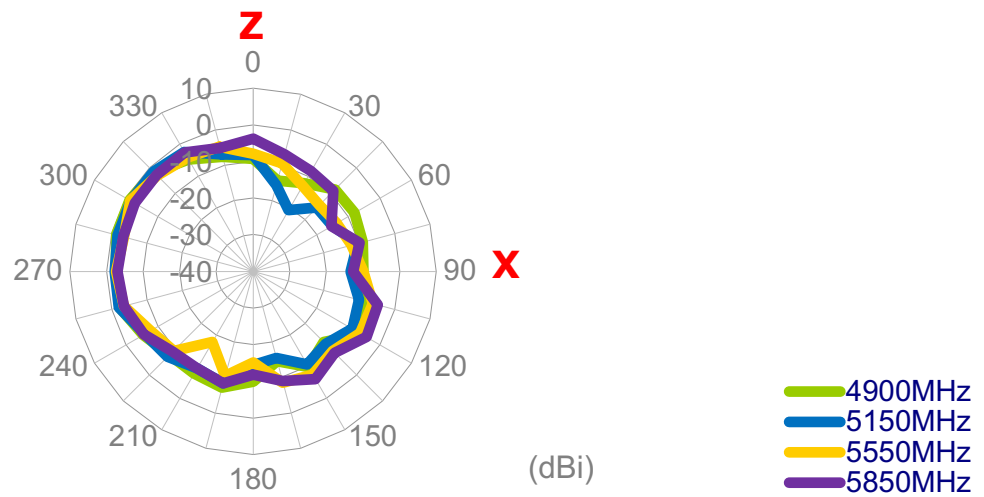
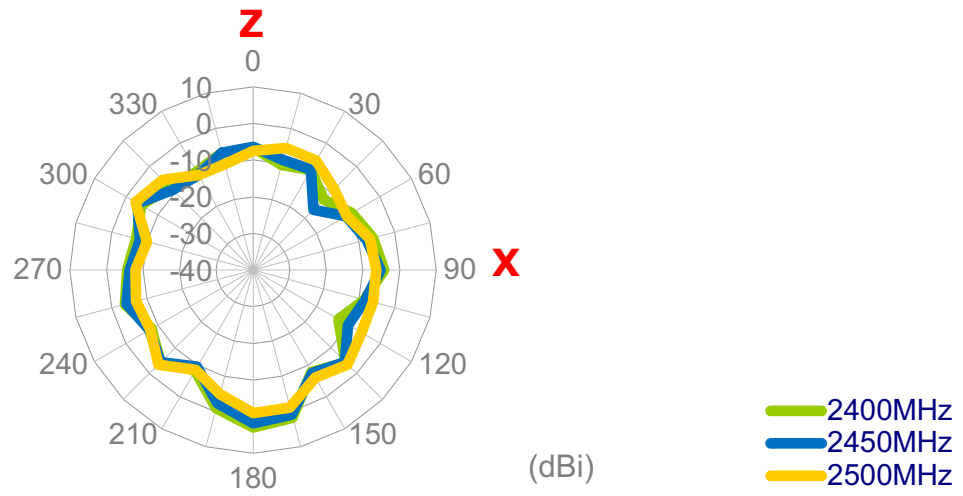


### 4.2.3 WI-FI MIMO1\_On 30x30cm GND

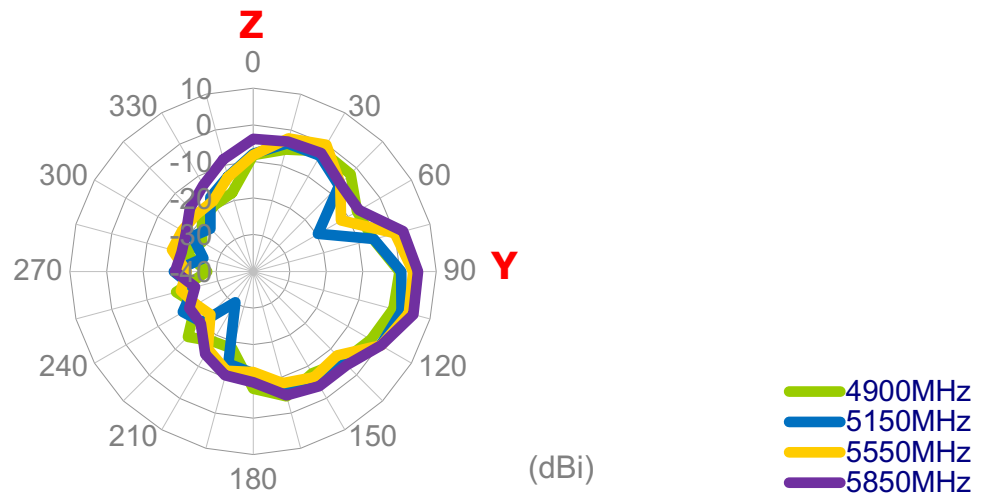
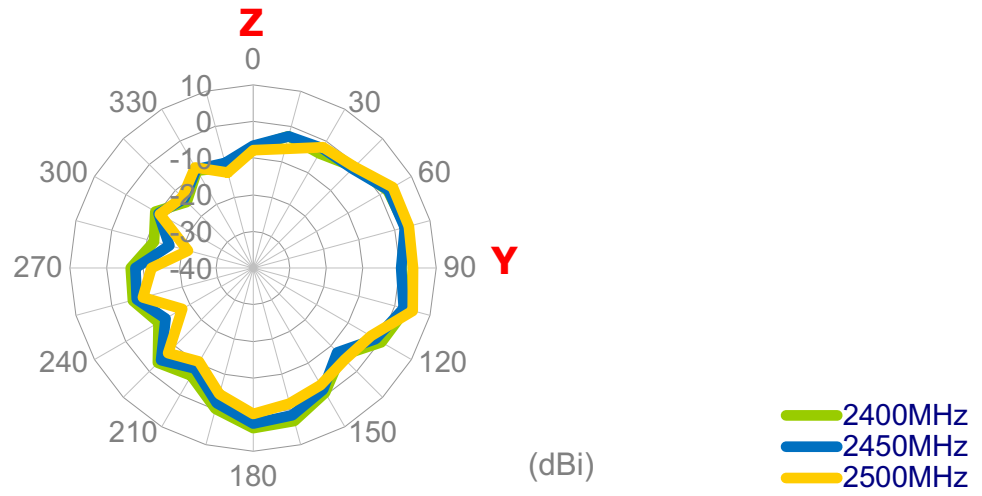
#### XY Plane



**XZ Plane**

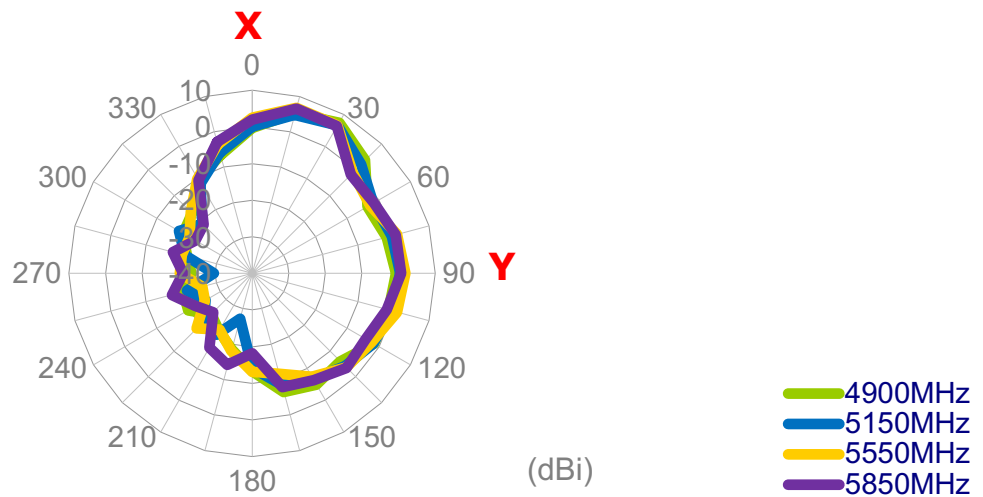
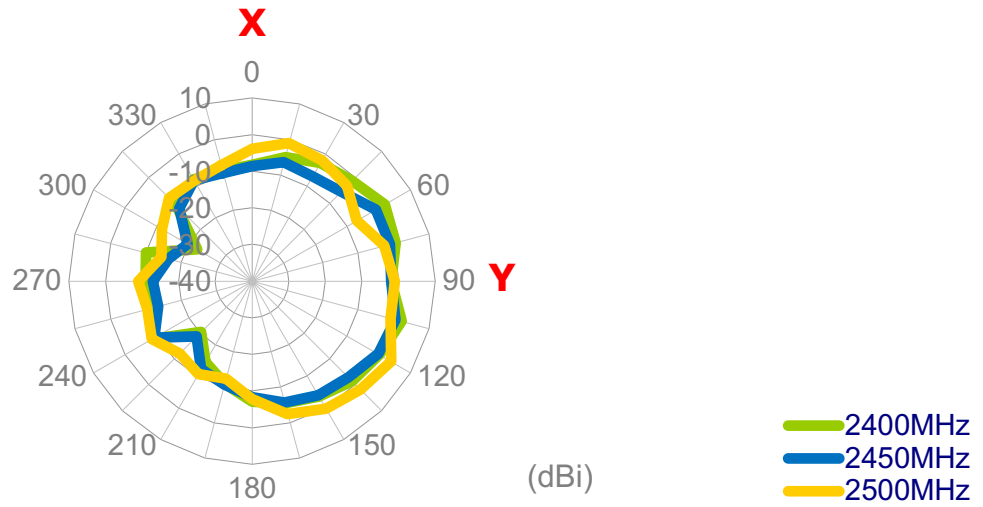


**YZ Plane**

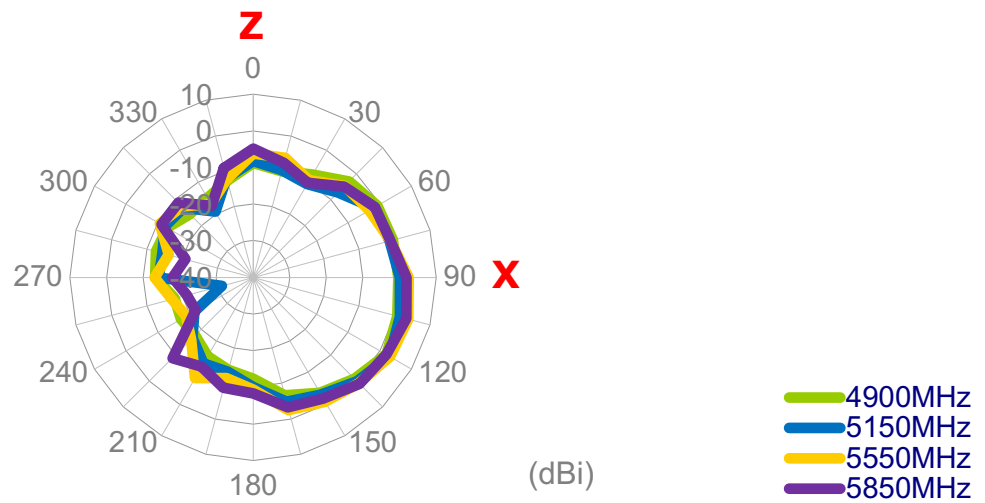
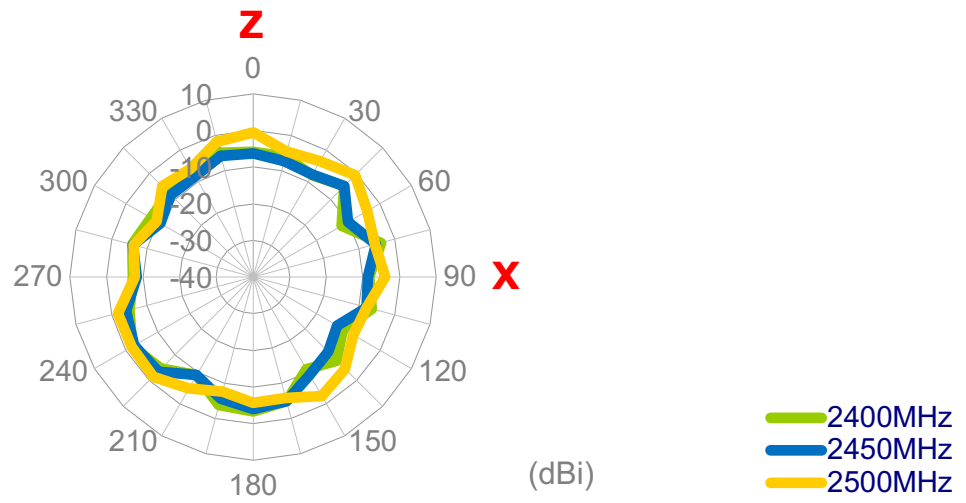


### 4.2.4 WI-FI MIMO2\_On 30x30cm GND

#### XY Plane

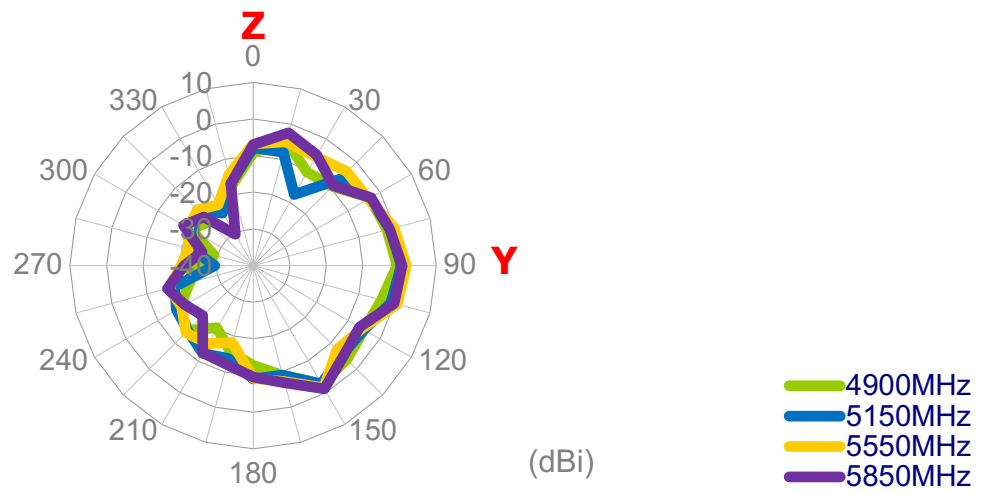
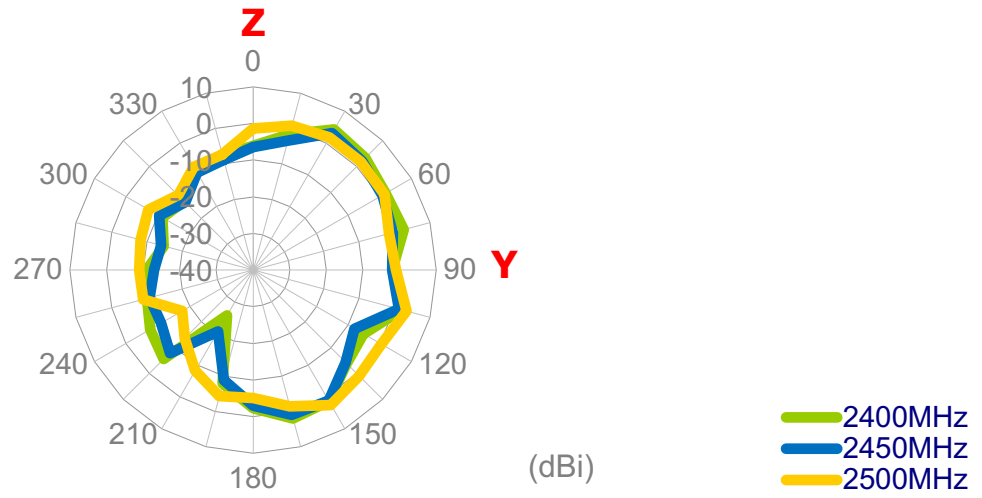


**XZ Plane**



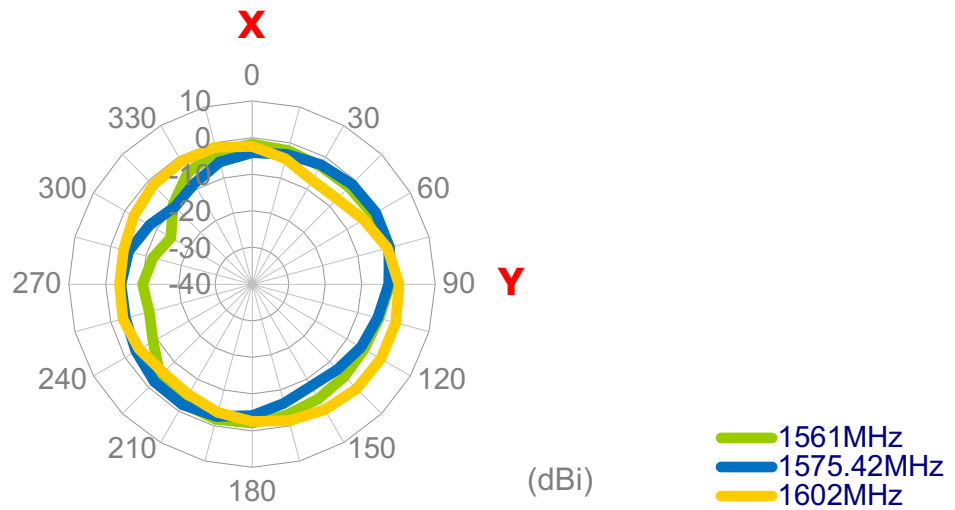


**YZ Plane**

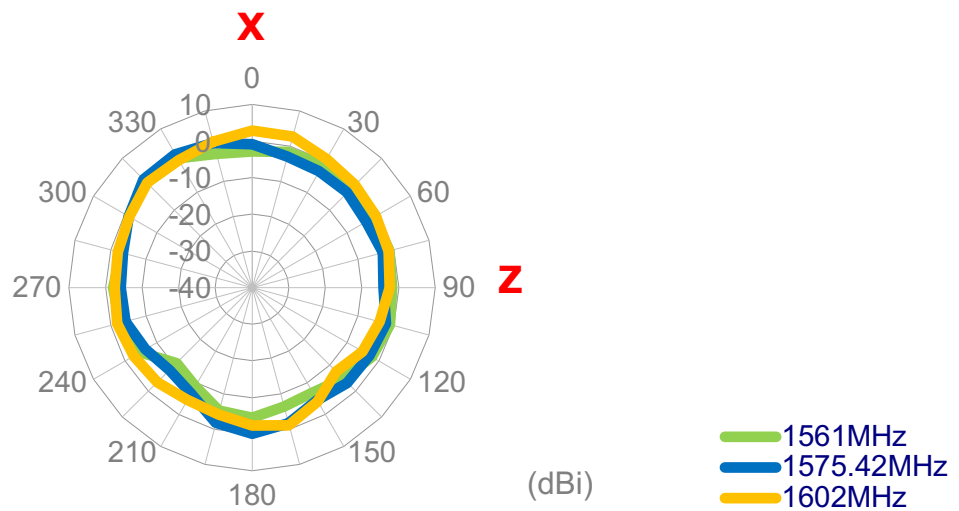


## 4.2.5 GNSS

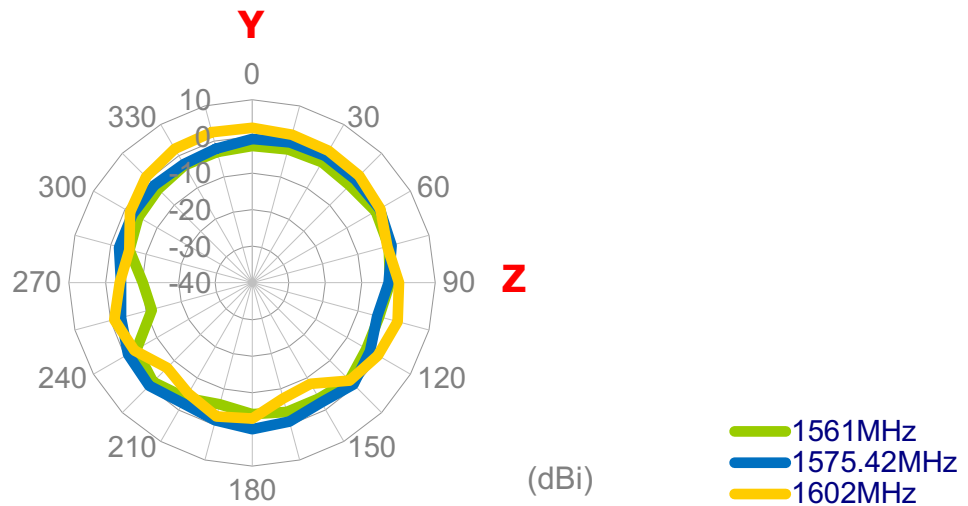
### XY Plane



### XZ Plane

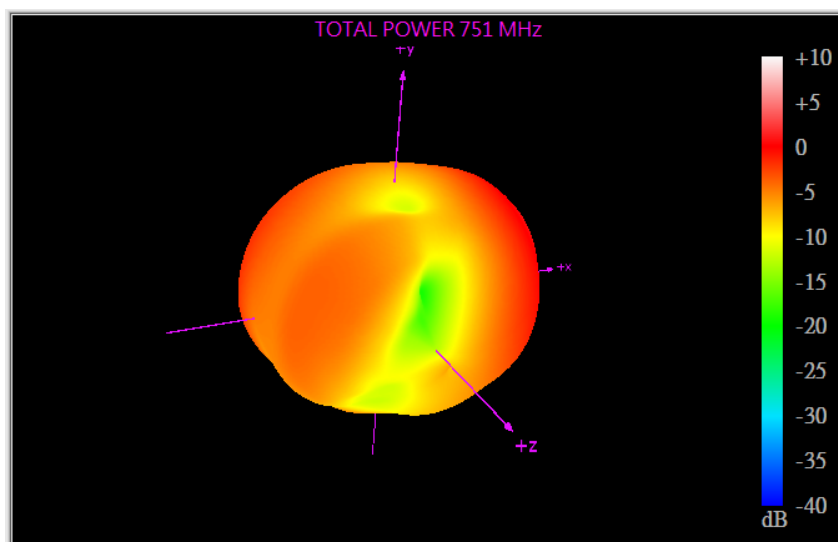
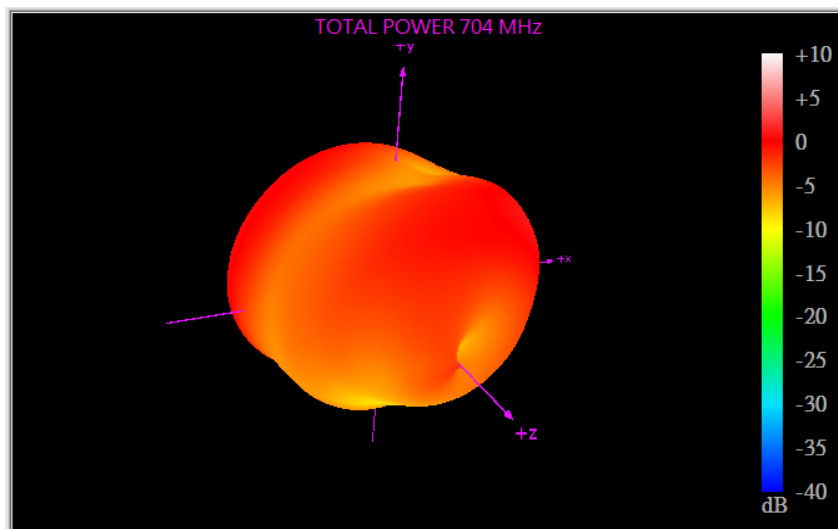
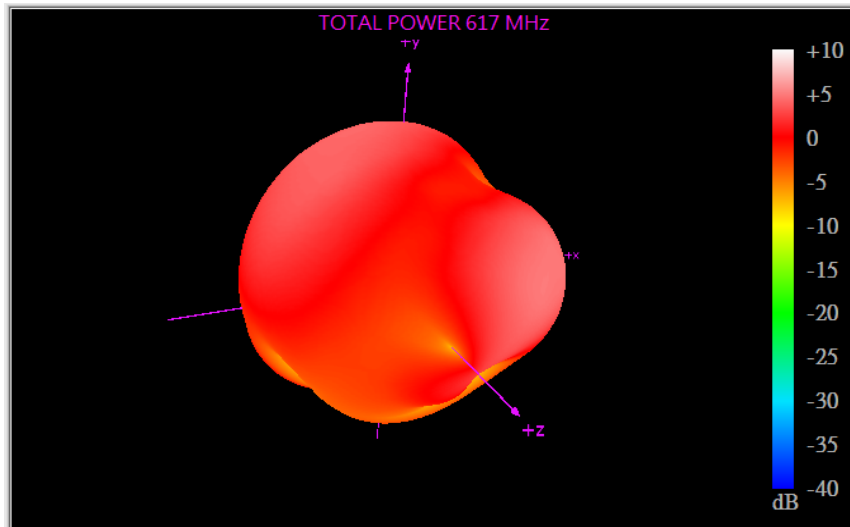


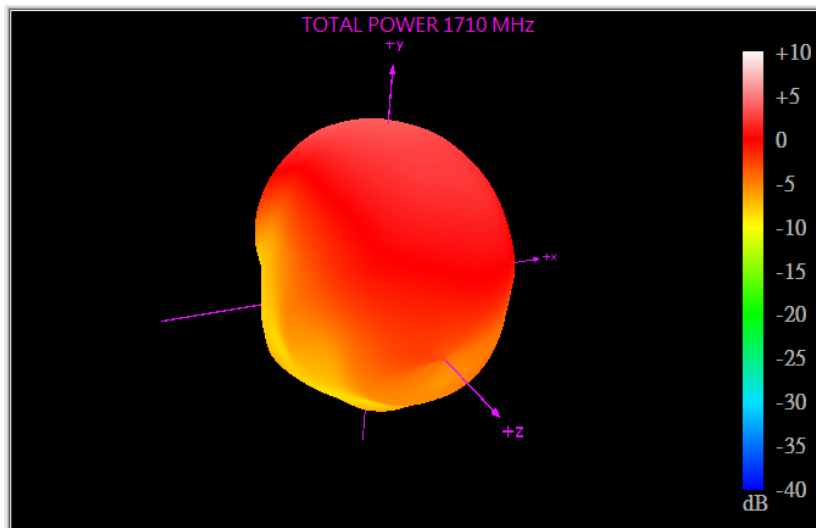
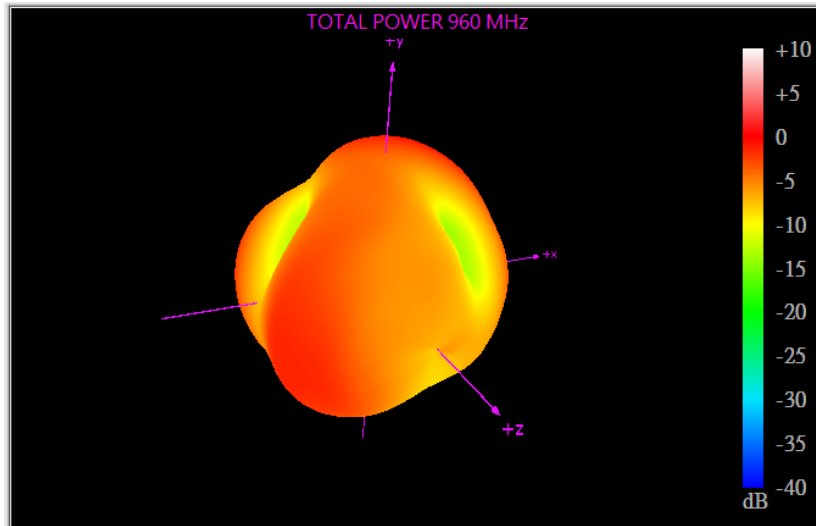
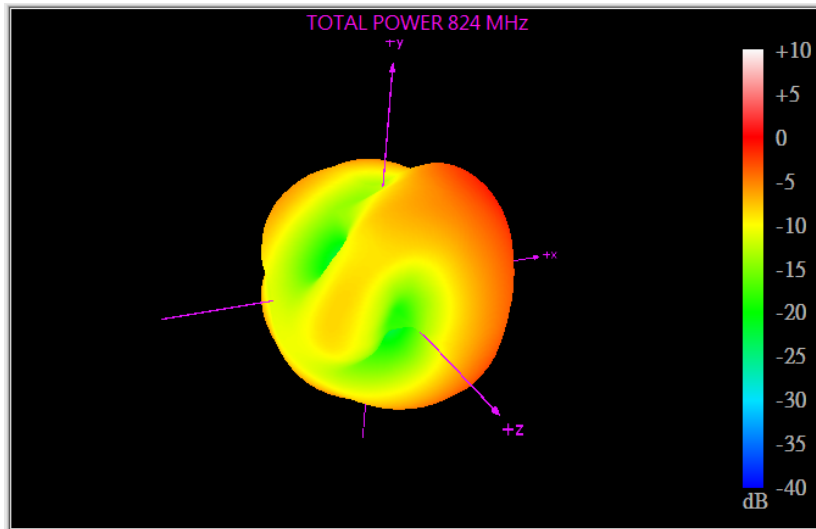
### YZ Plane

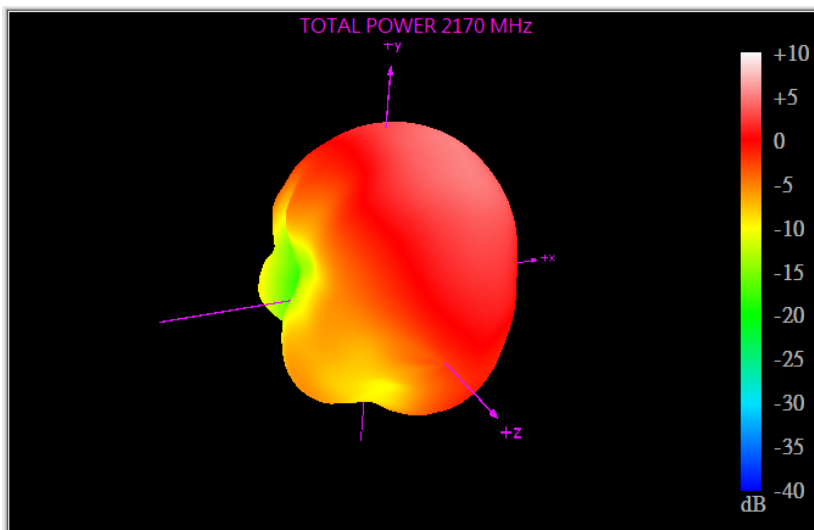
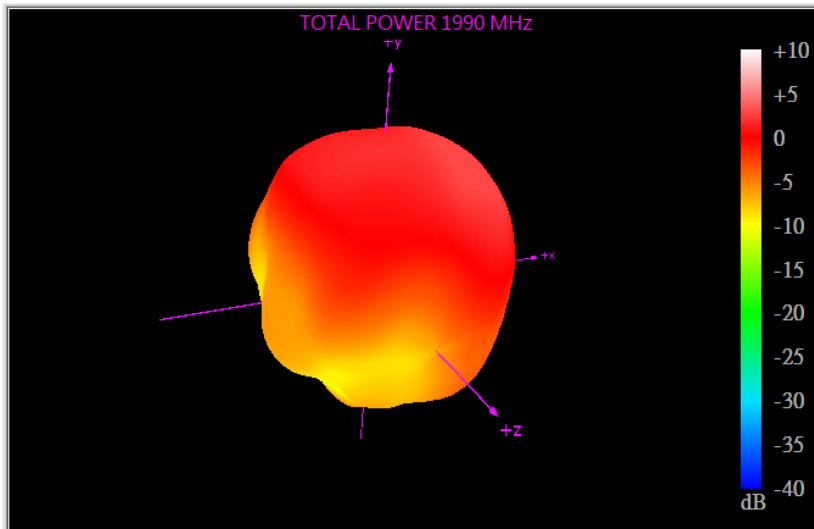
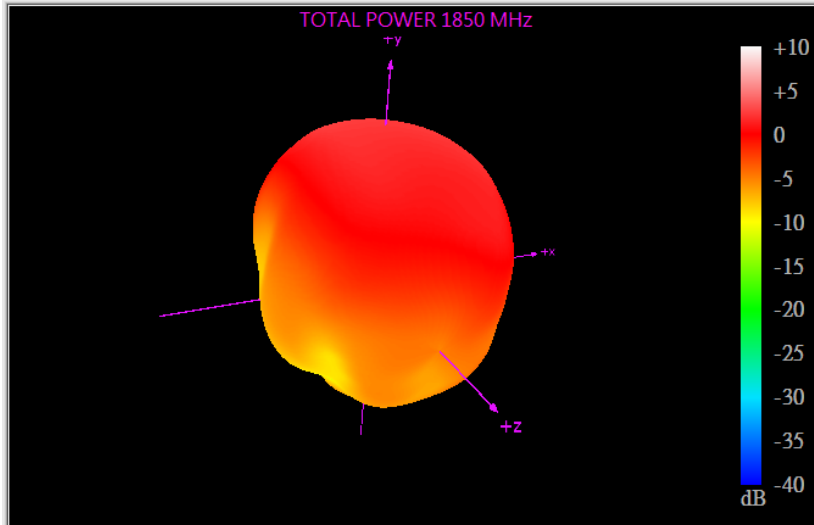


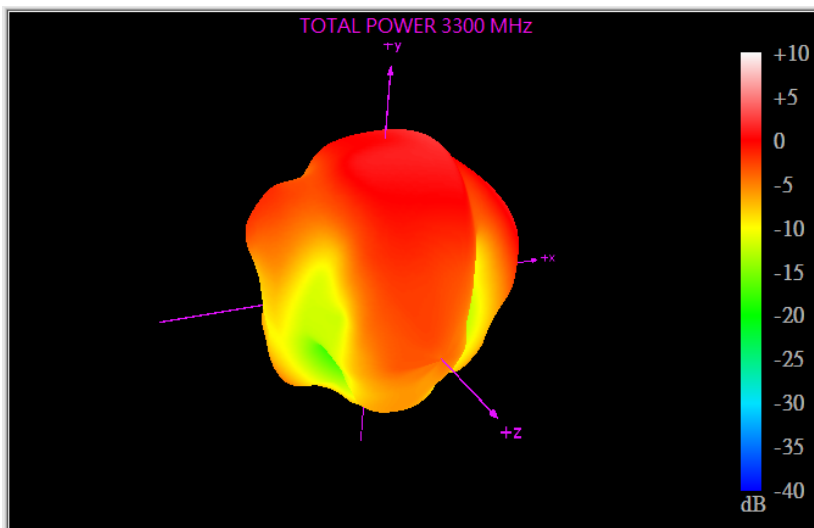
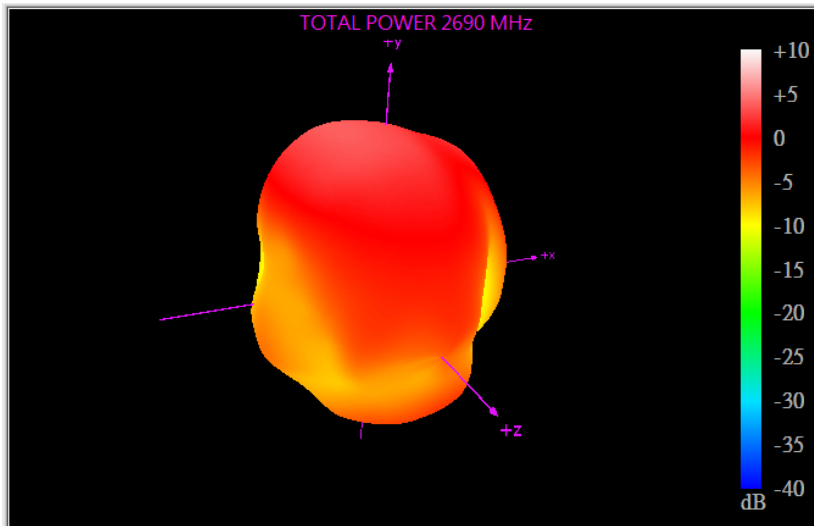
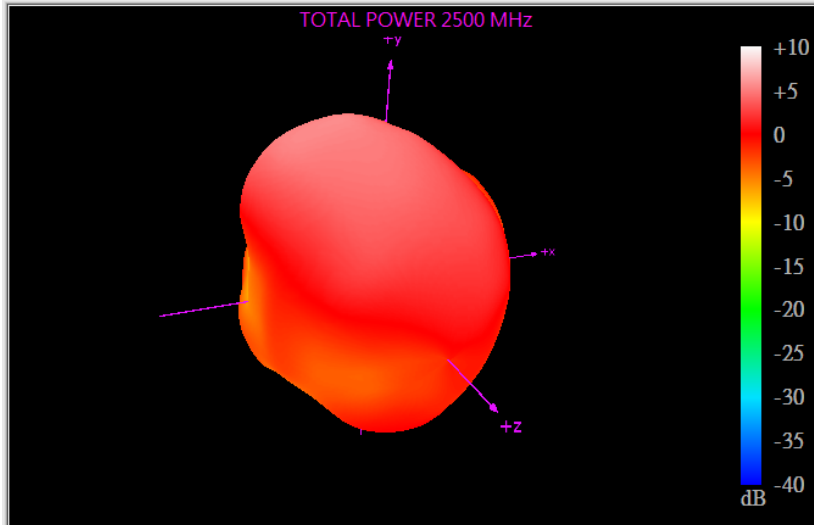
### 3D Radiation Patterns

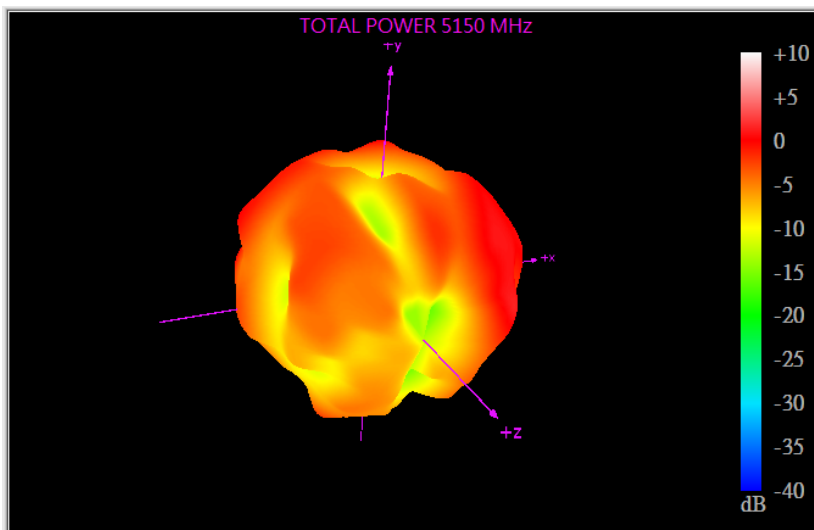
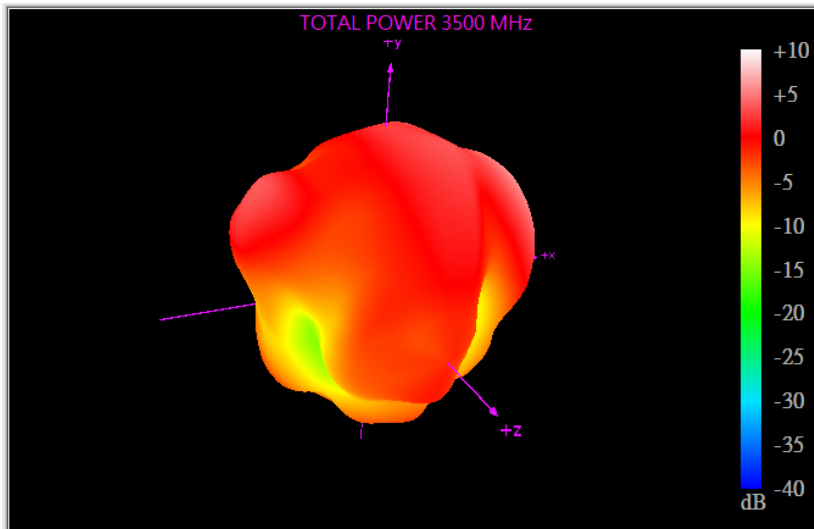
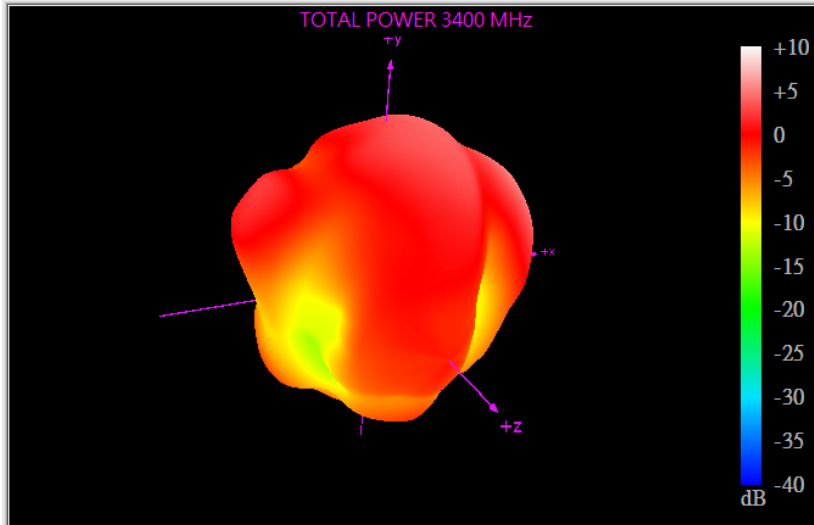
#### 4.2.6 LTE MIMO1\_ On 30x30cm GND

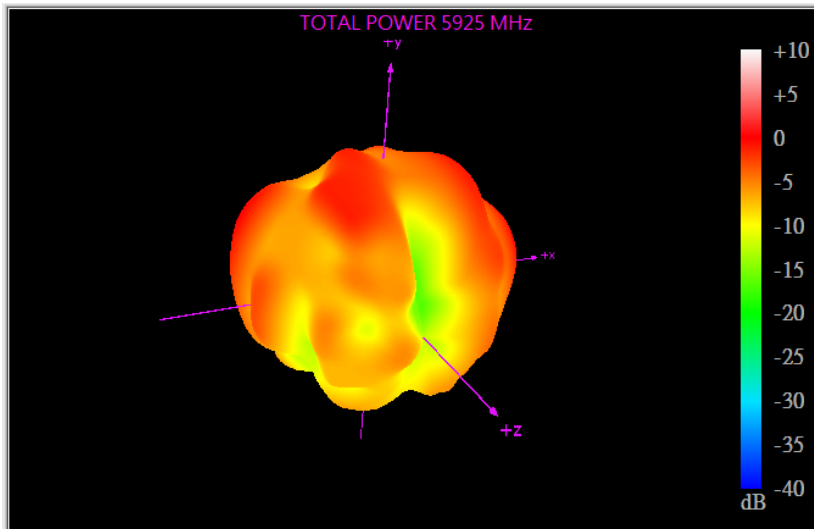
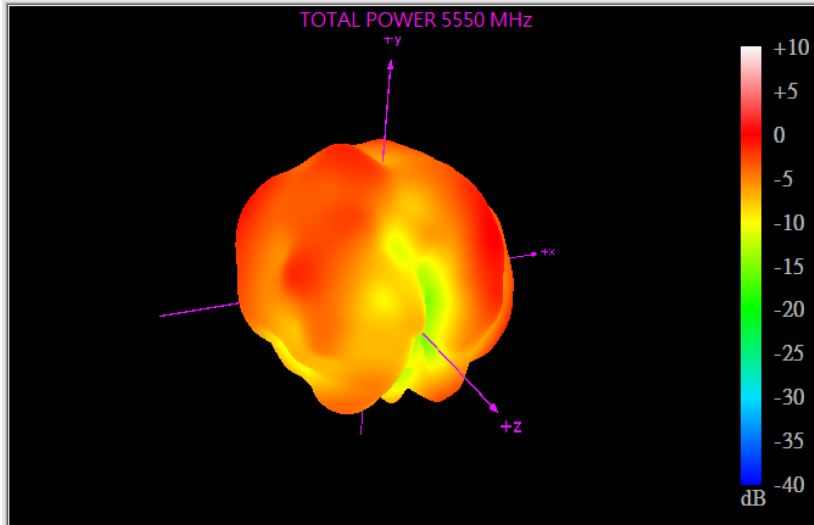






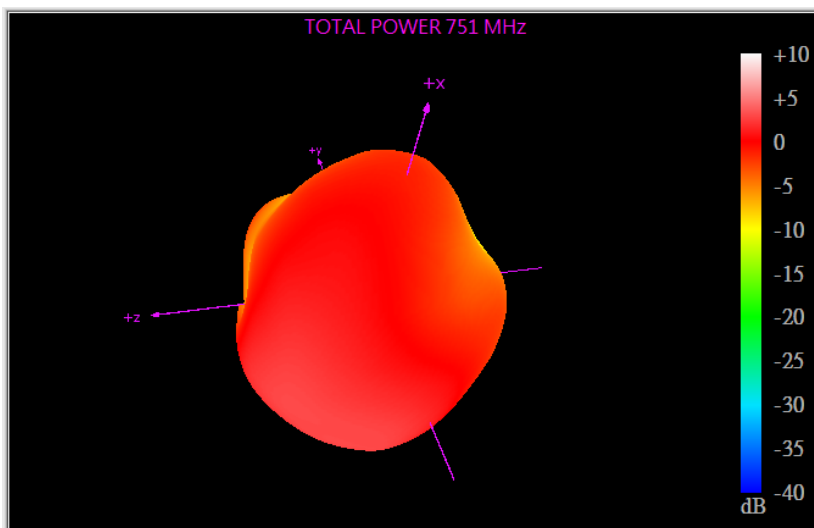
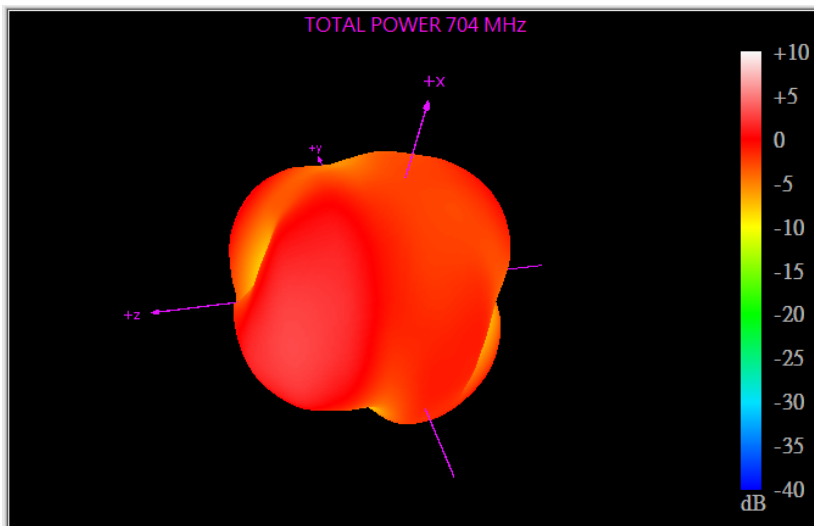
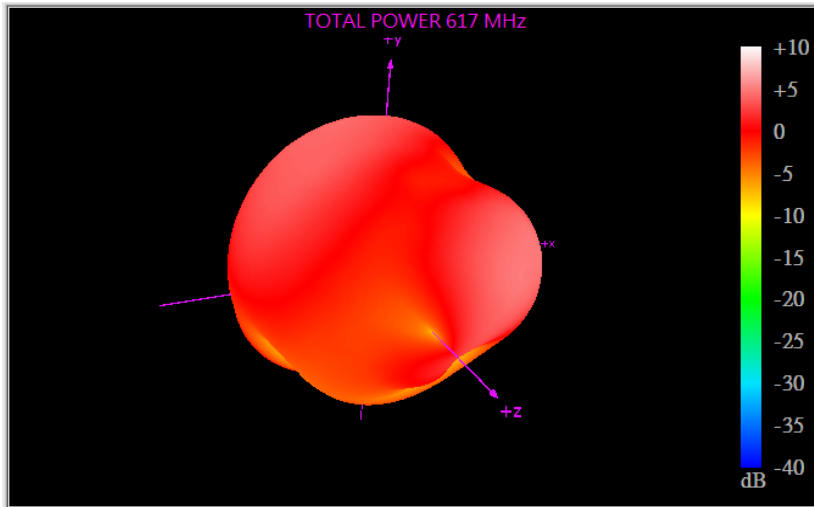


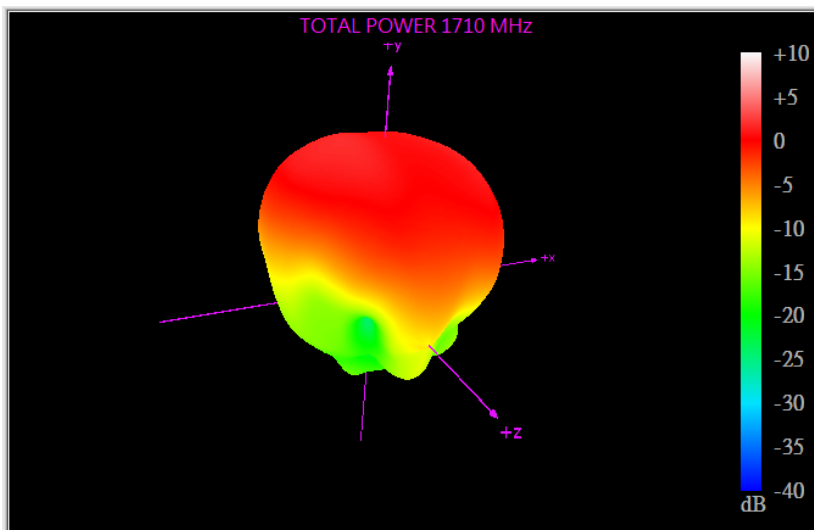
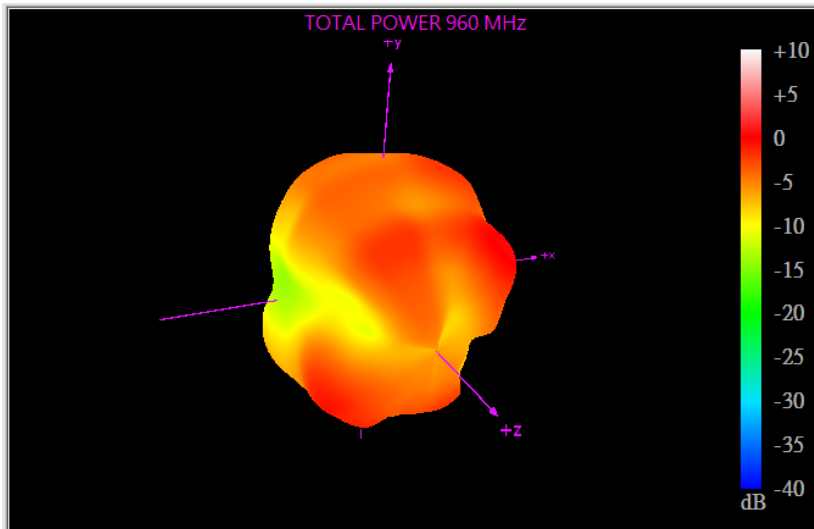
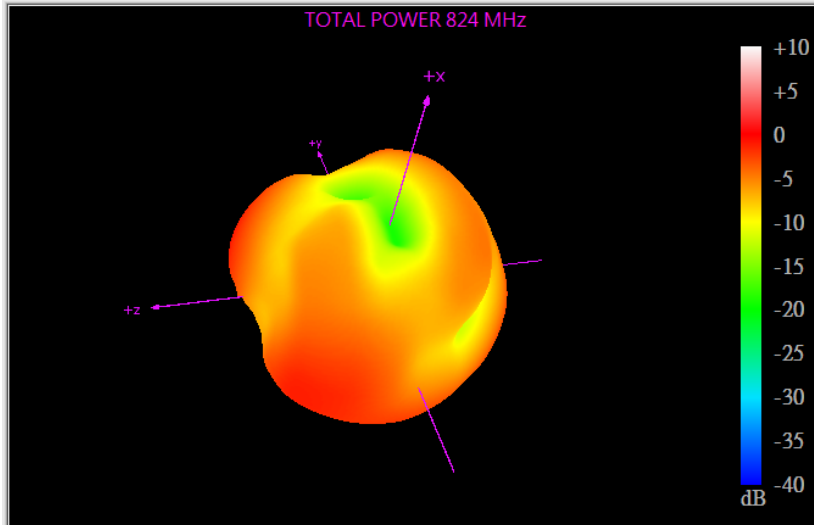


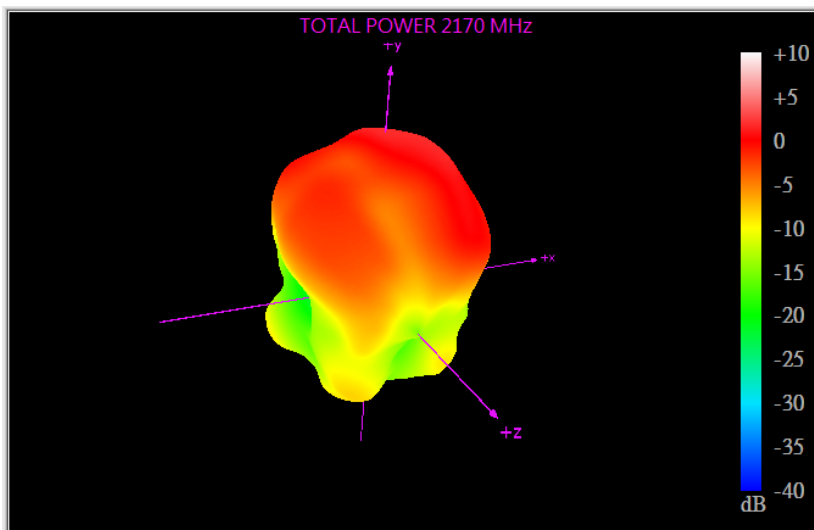
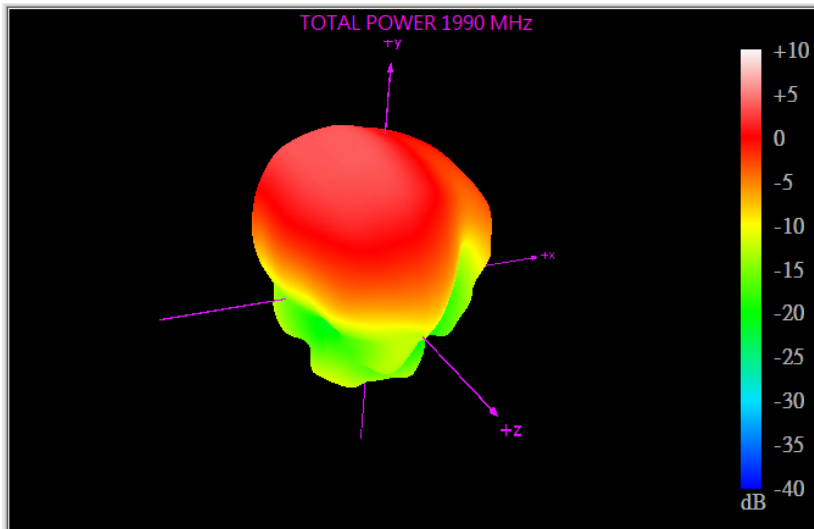
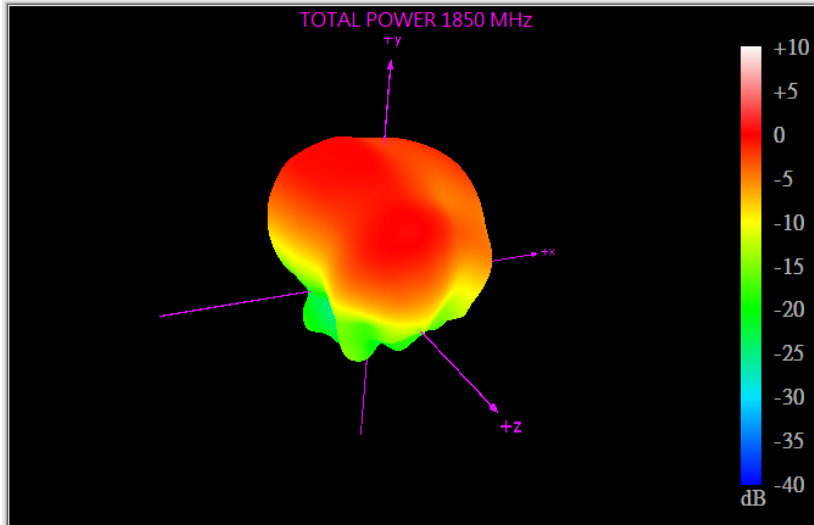


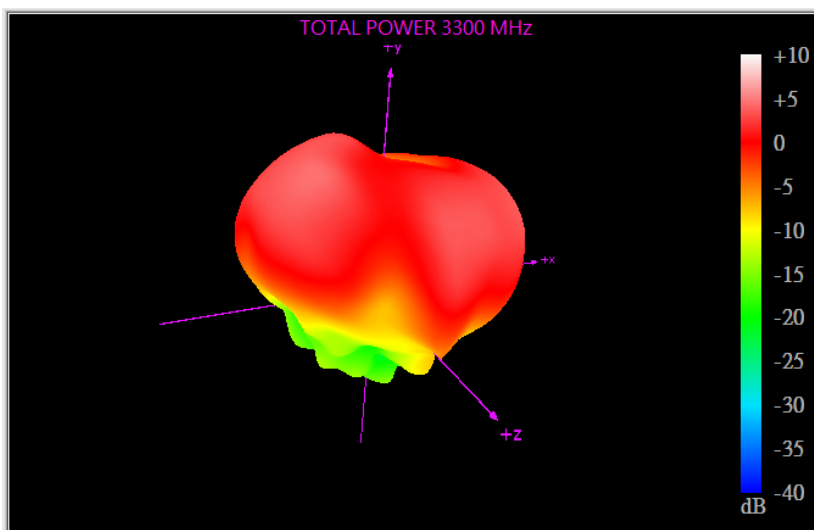
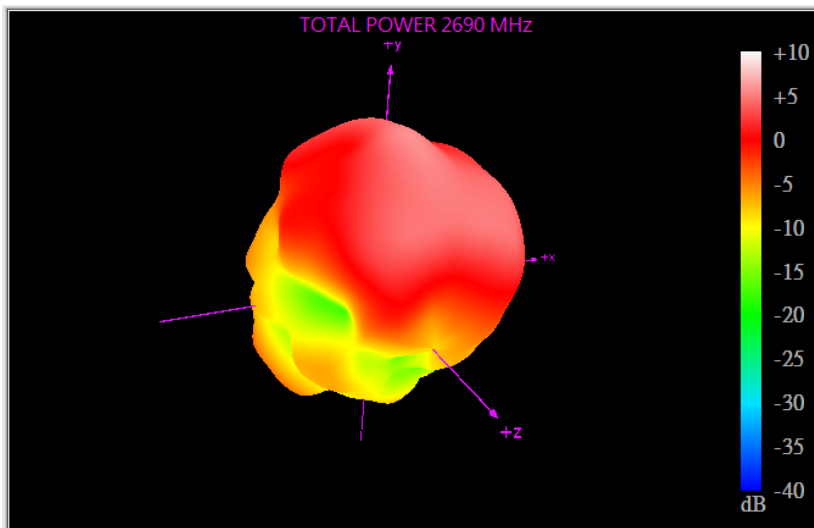
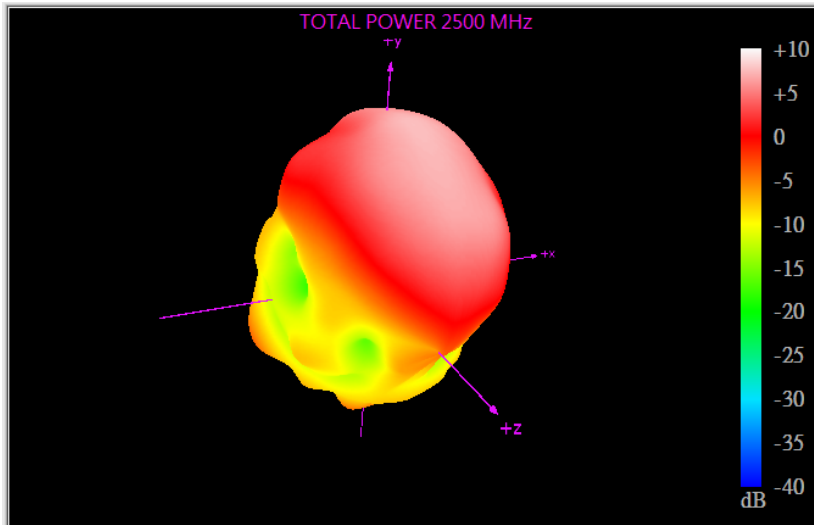


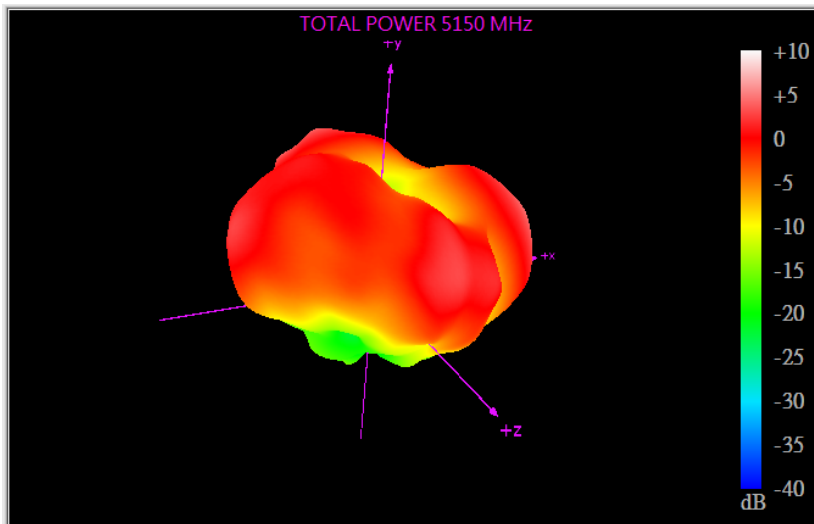
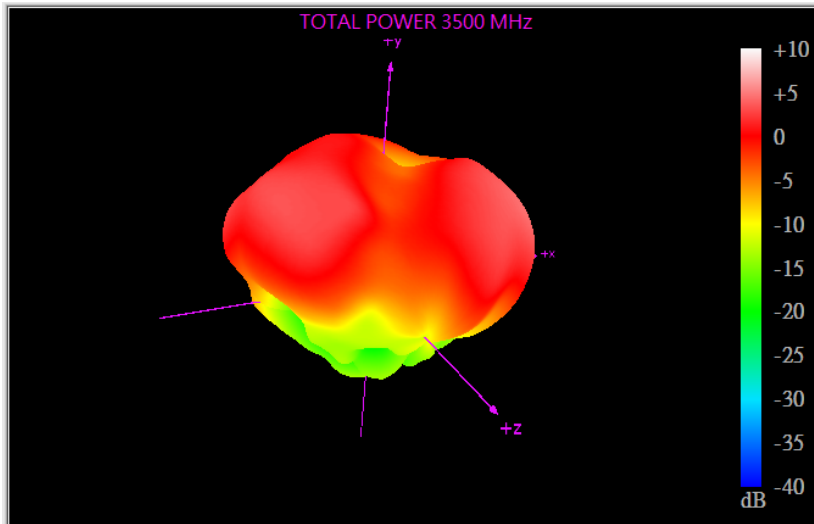
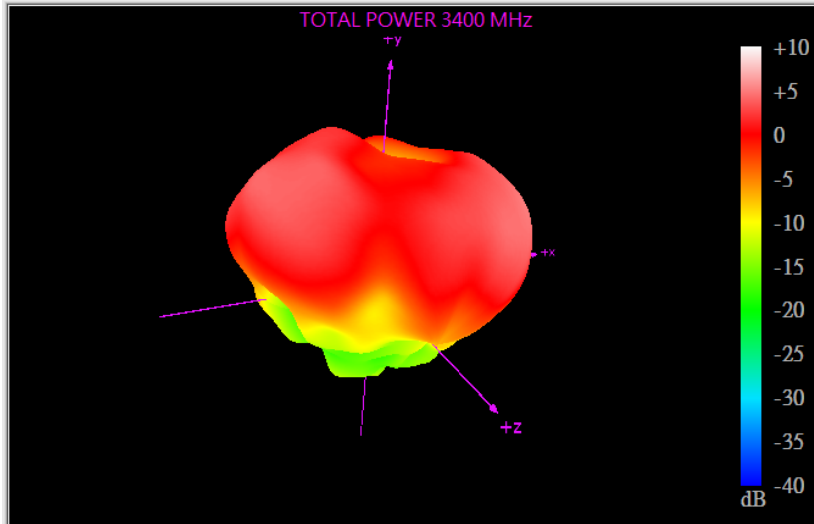
### 4.2.7 LTE MIMO2\_ On 30x30cm GND

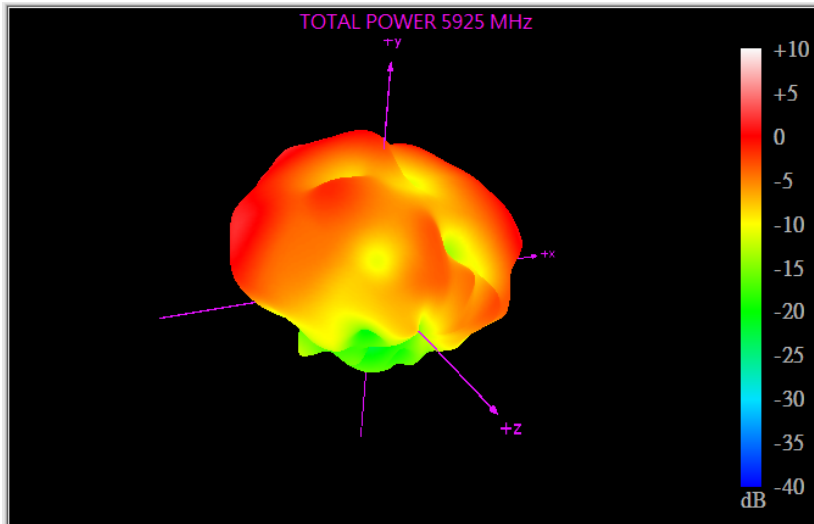
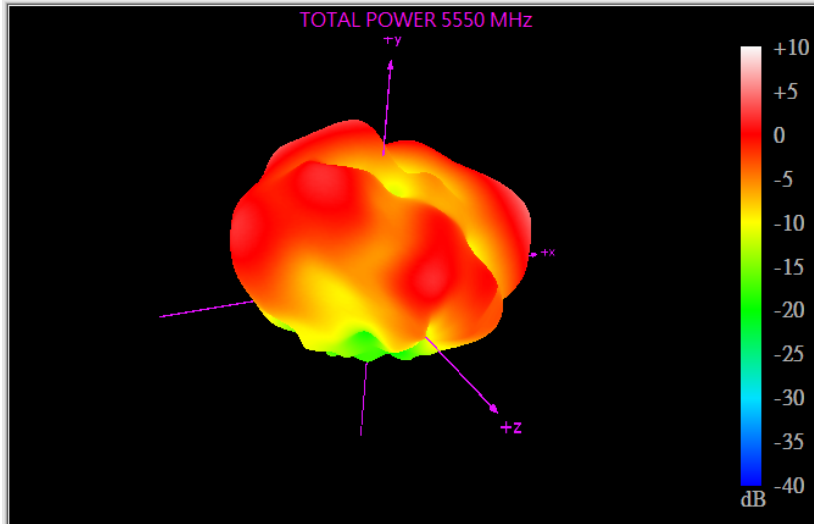




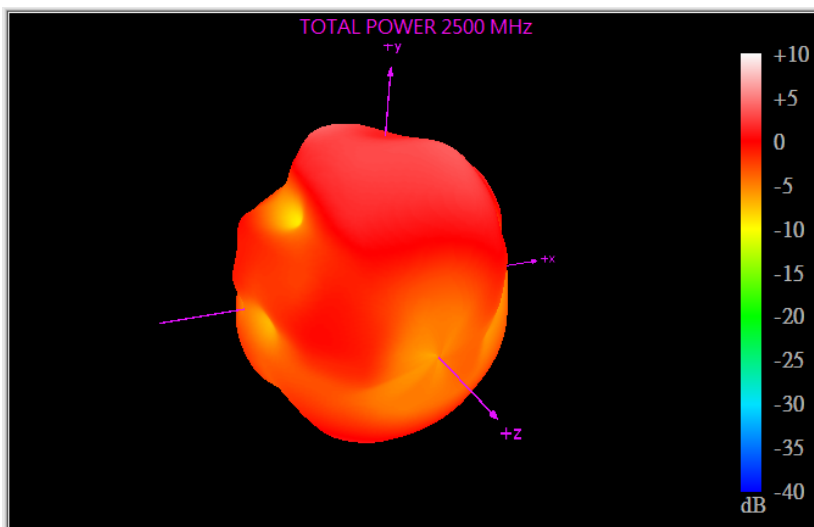
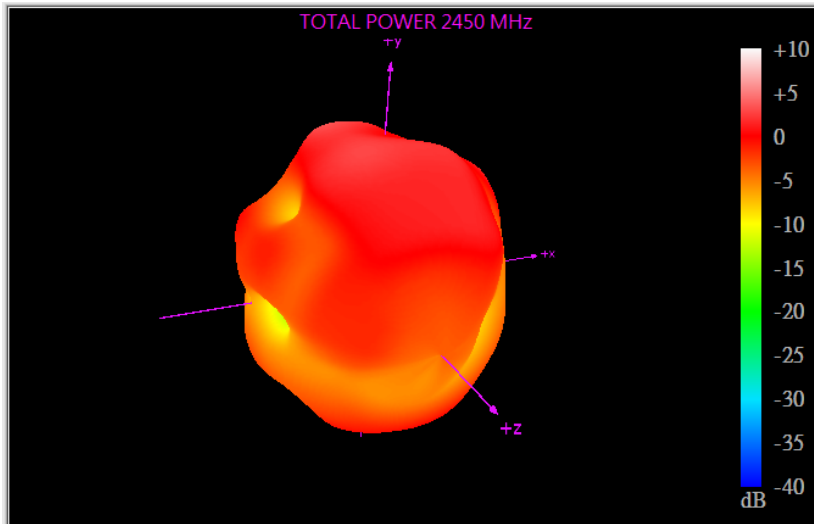
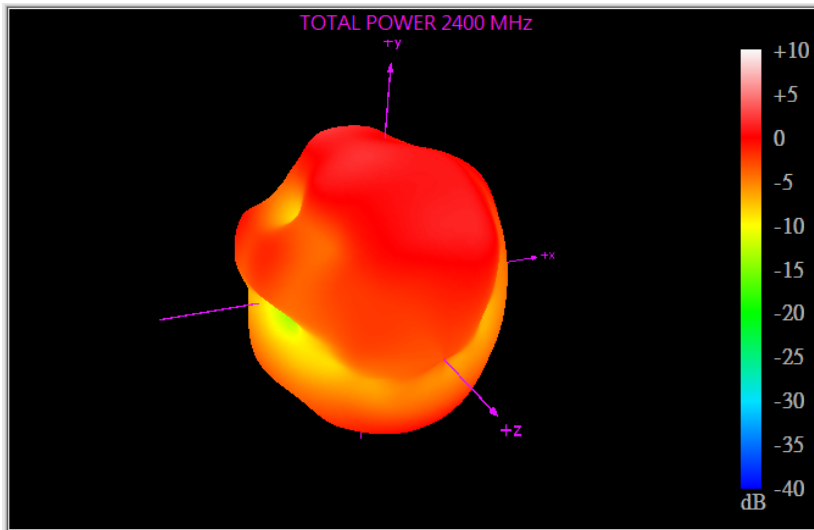


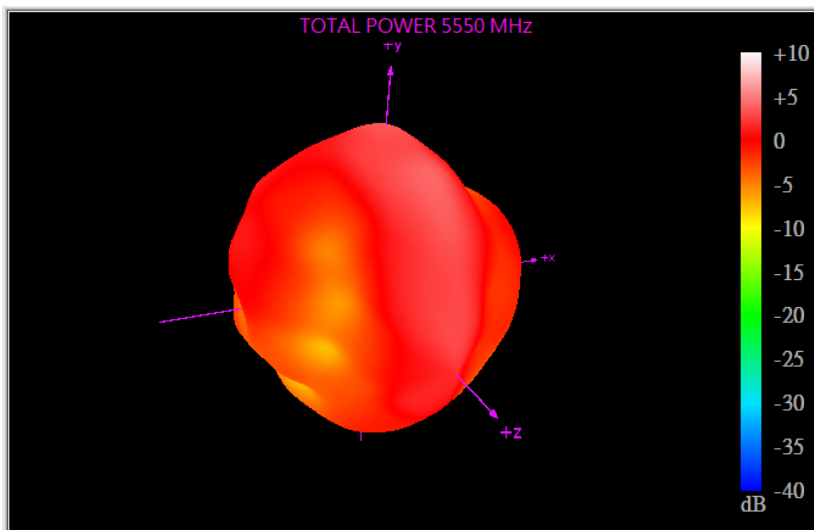
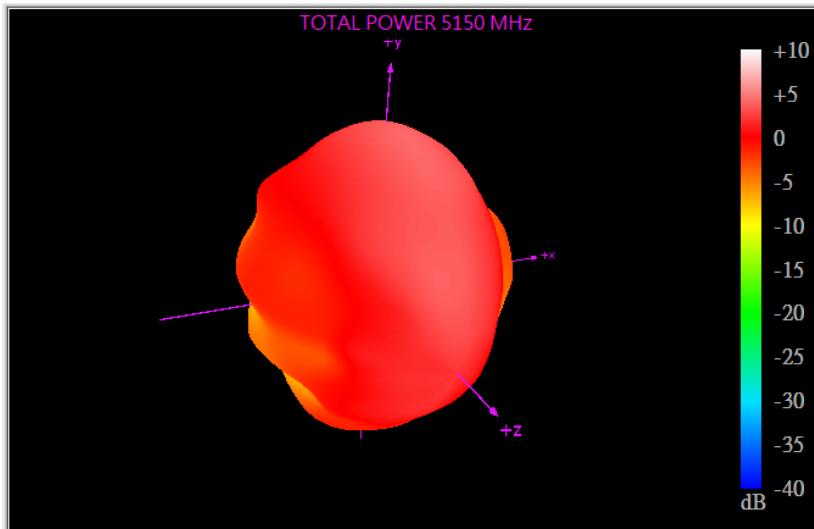
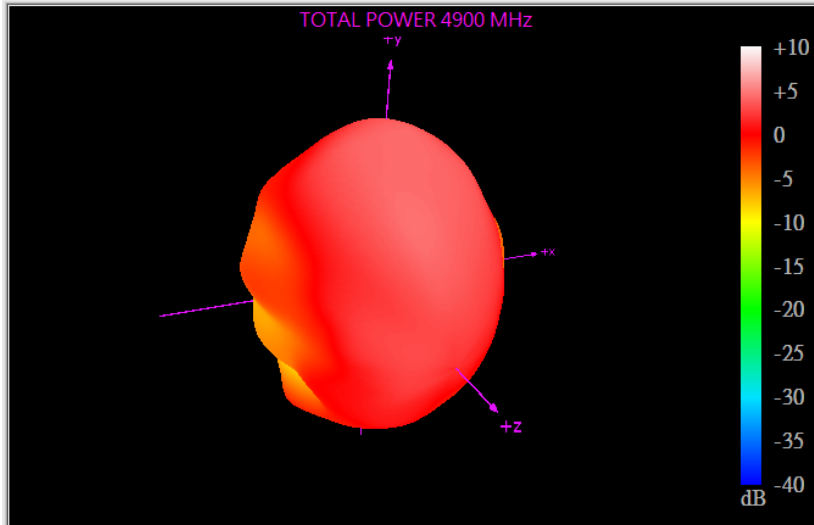




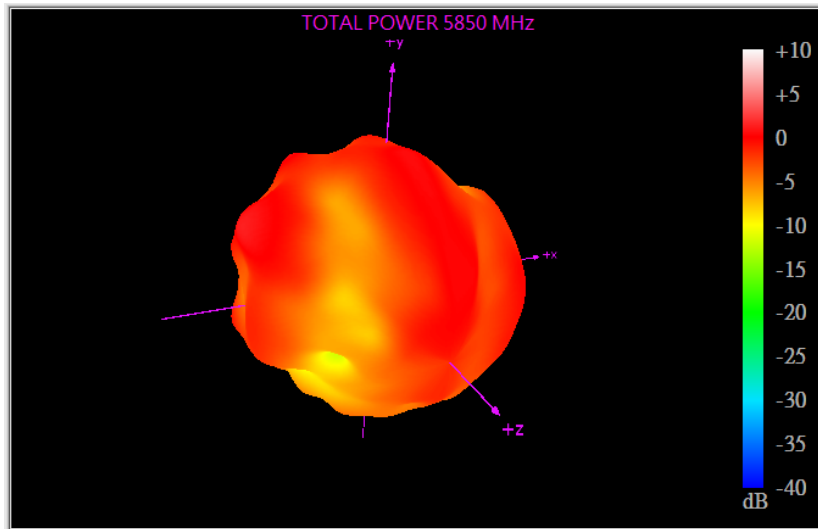


#### 4.2.8 WI-FI MIMO1\_ On 30x30cm GND

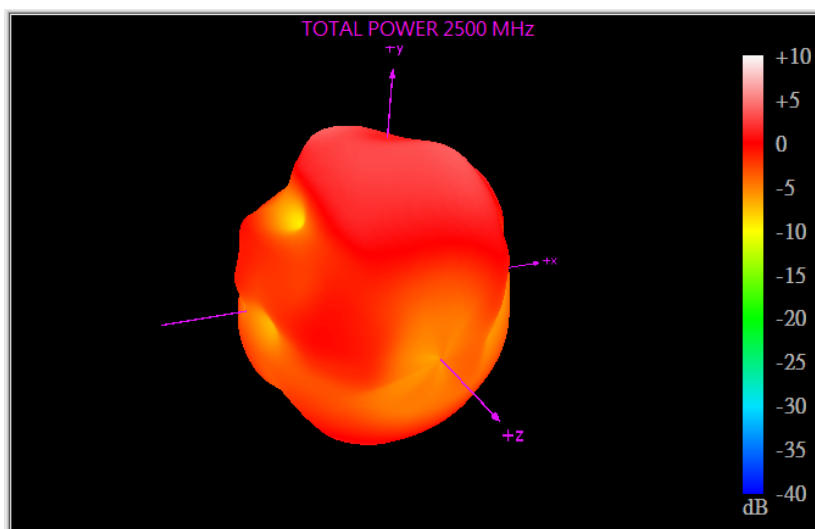
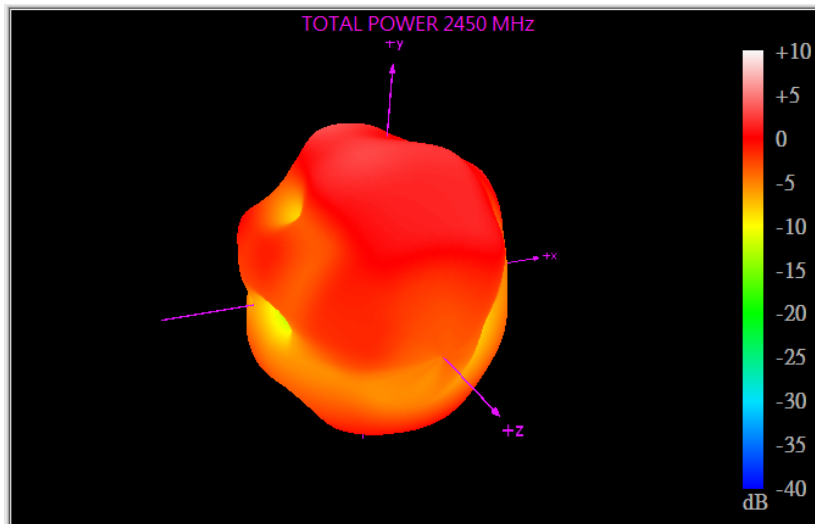
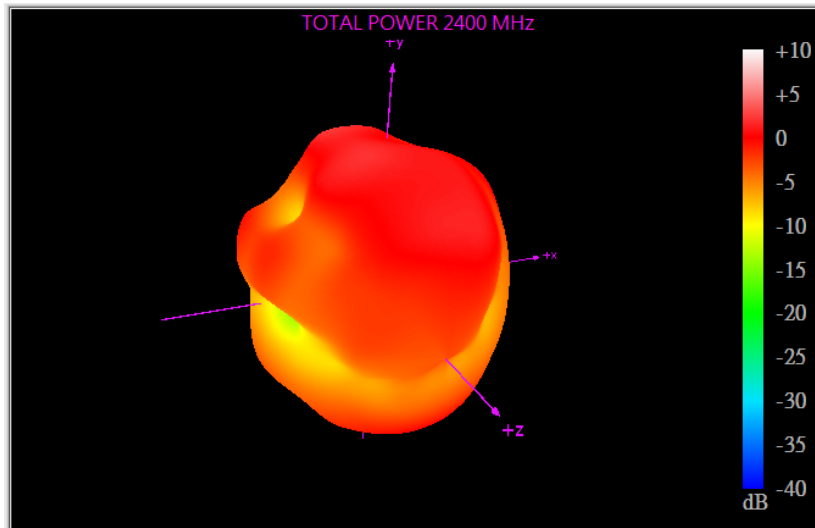


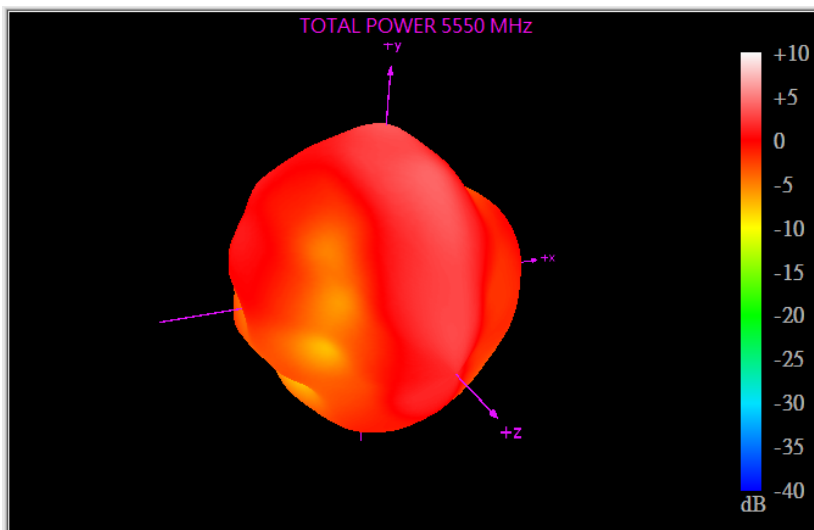
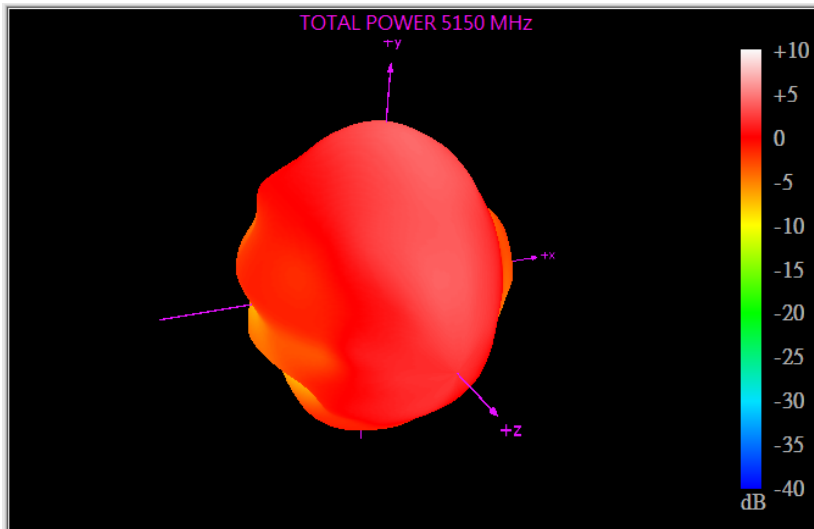
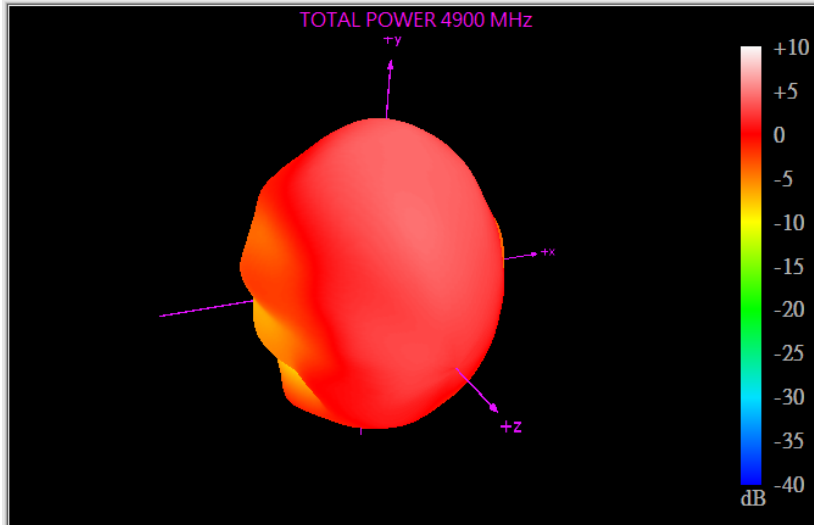


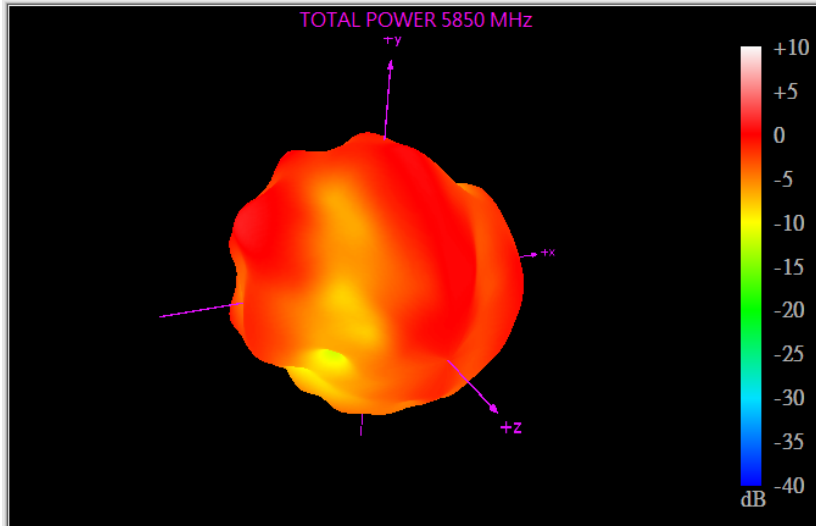




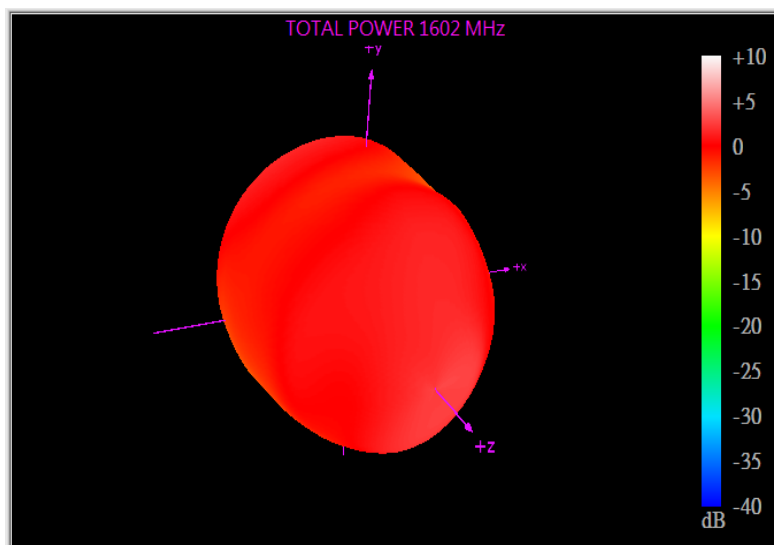
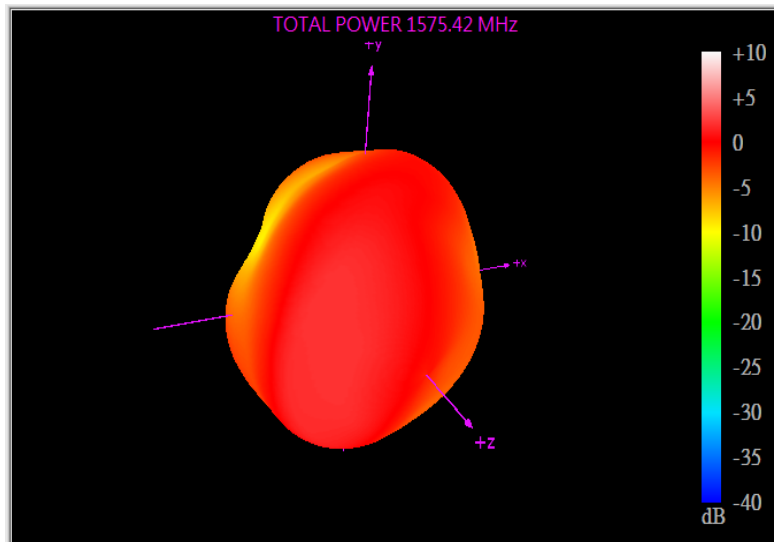
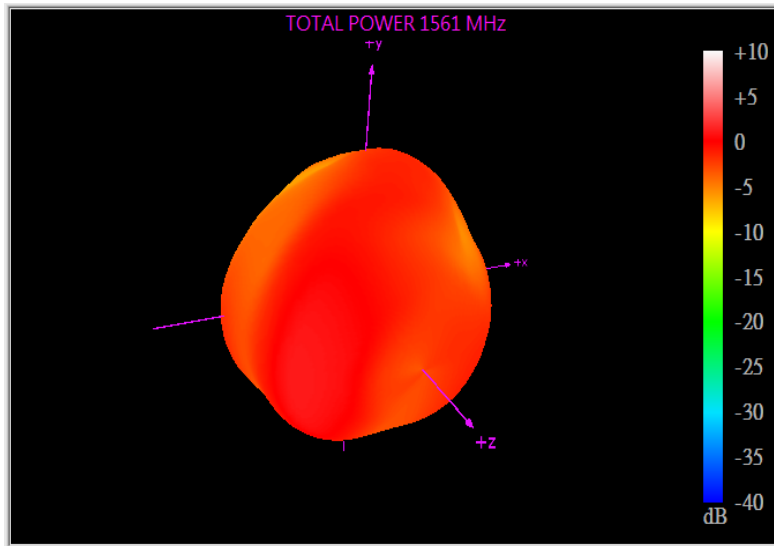
#### 4.2.9 WI-FI MIMO2\_ On 30x30cm GND



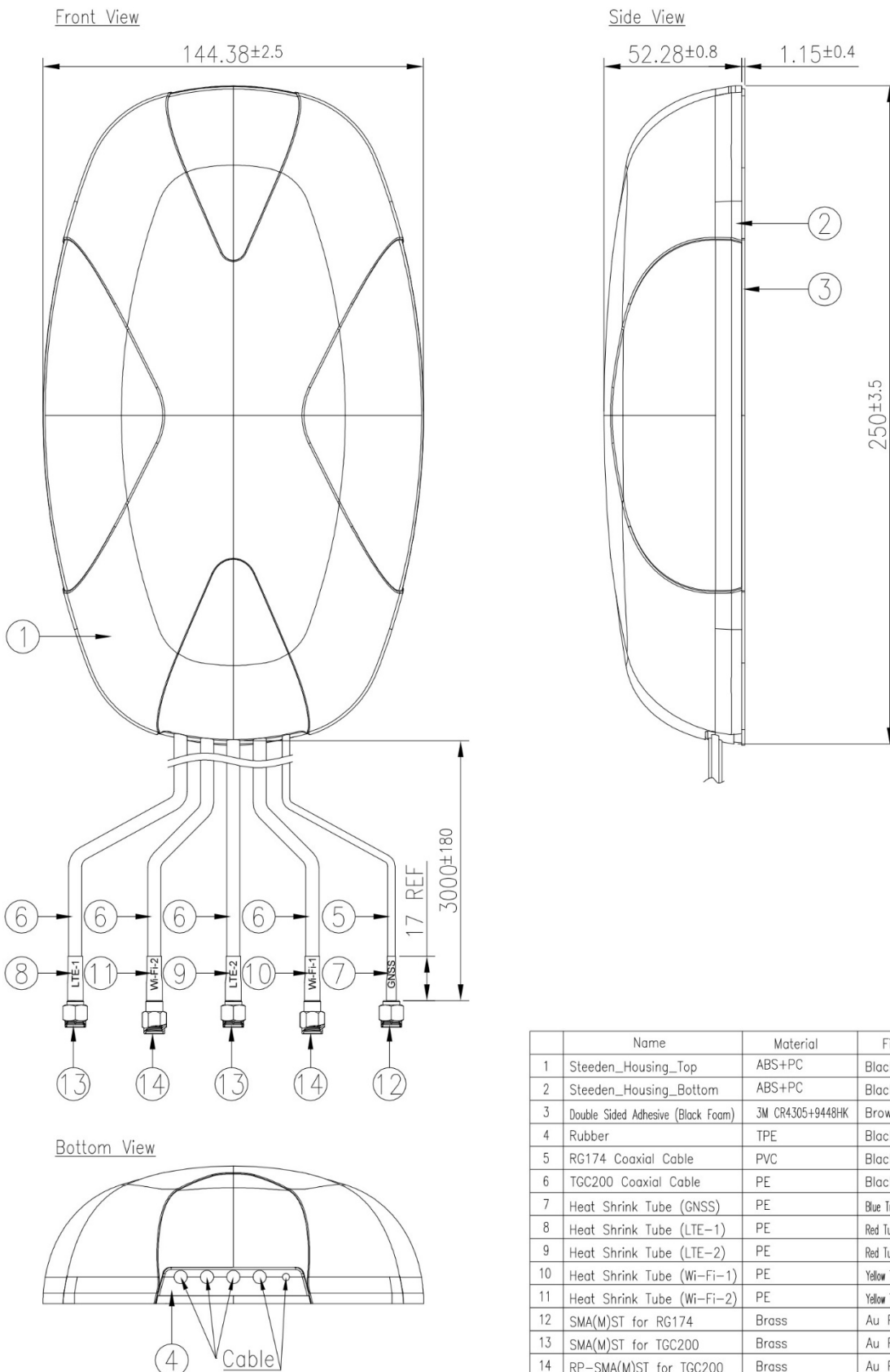




### 4.1.1 GNSS



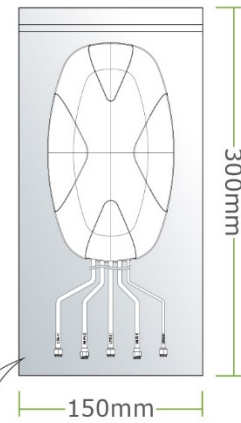
## 5. Mechanical Drawing (Unit: mm)



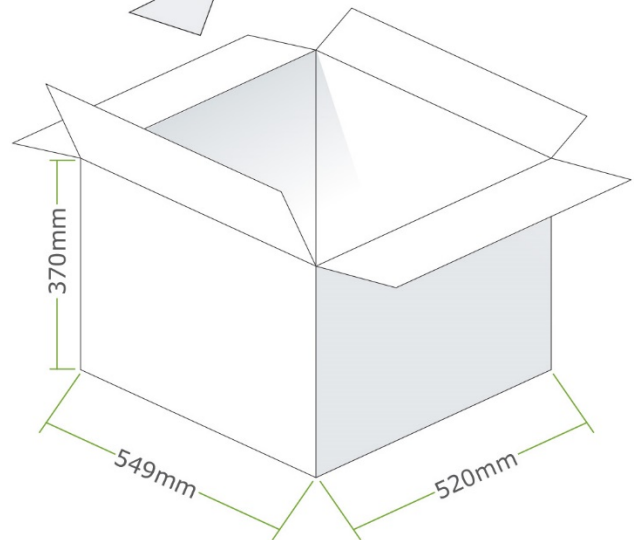
	Name	Material	Finish	QTY
1	Steeden_Housing_Top	ABS+PC	Black	1
2	Steeden_Housing_Bottom	ABS+PC	Black	1
3	Double Sided Adhesive (Black Foam)	3M CR4305+9448HK	Brown Liner	1
4	Rubber	TPE	Black	1
5	RG174 Coaxial Cable	PVC	Black	1
6	TGC200 Coaxial Cable	PE	Black	4
7	Heat Shrink Tube (GNSS)	PE	Blue Tube/White Text	1
8	Heat Shrink Tube (LTE-1)	PE	Red Tube/White Text	1
9	Heat Shrink Tube (LTE-2)	PE	Red Tube/White Text	1
10	Heat Shrink Tube (Wi-Fi-1)	PE	Yellow Tube/Black Text	1
11	Heat Shrink Tube (Wi-Fi-2)	PE	Yellow Tube/Black Text	1
12	SMA(M)ST for RG174	Brass	Au Plated	1
13	SMA(M)ST for TGC200	Brass	Au Plated	2
14	RP-SMA(M)ST for TGC200	Brass	Au Plated	2

## 6. Packaging

1pc MA350.A.LBICG.003 per PE Bag  
PE Bag Dimensions - 300\*150mm  
Weight - 0.55Kg



12 PE Bags per Carton  
Box Dimensions - 549\*520\*370mm  
Weight - 6.6Kg

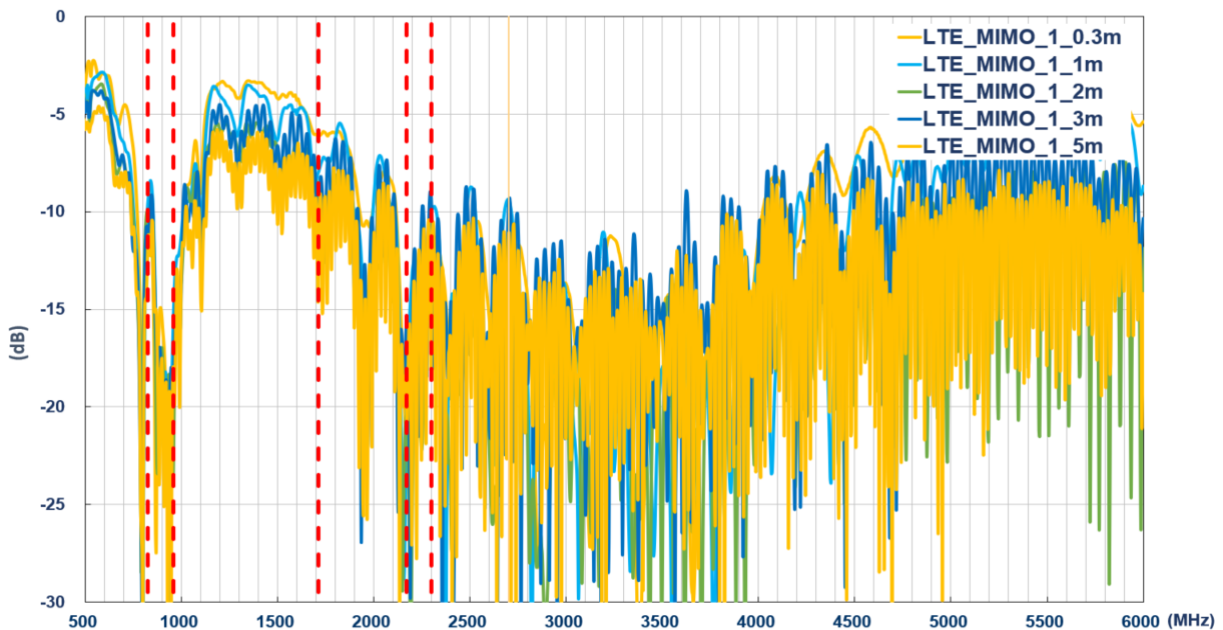


## 7. Application Note

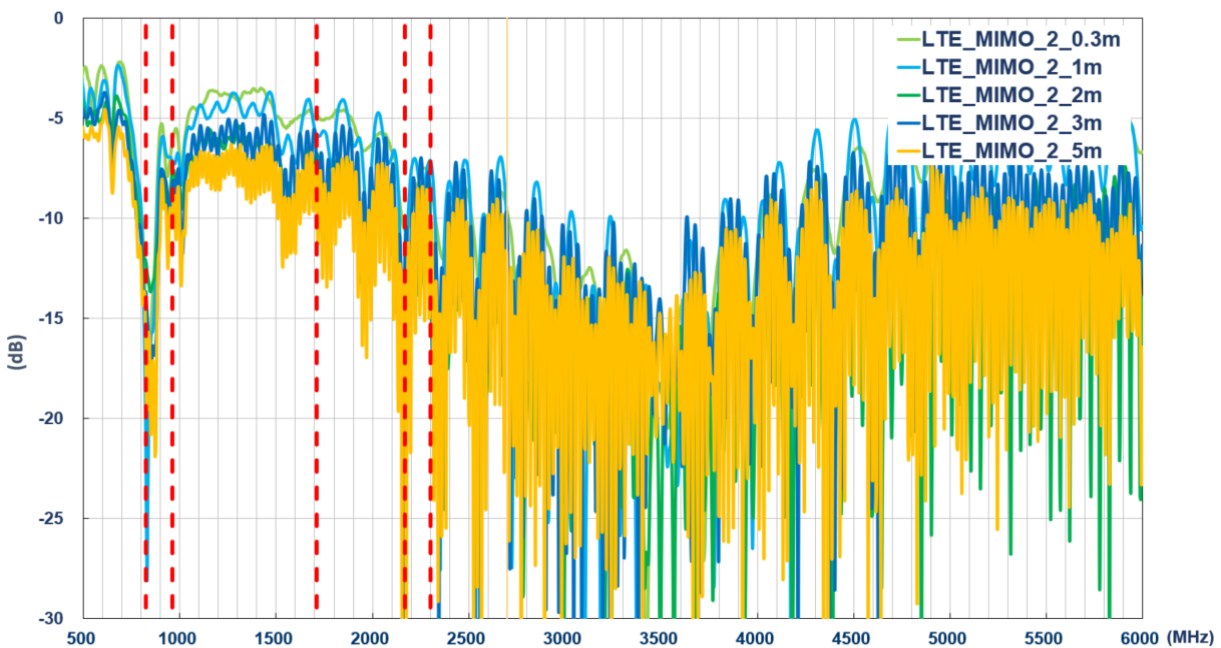
The MA350 antenna performance with different cable lengths is shown below.

### 7.1. Return Loss

#### Return Loss – LTE MIMO1 Antenna (On 30\*30cm GND)

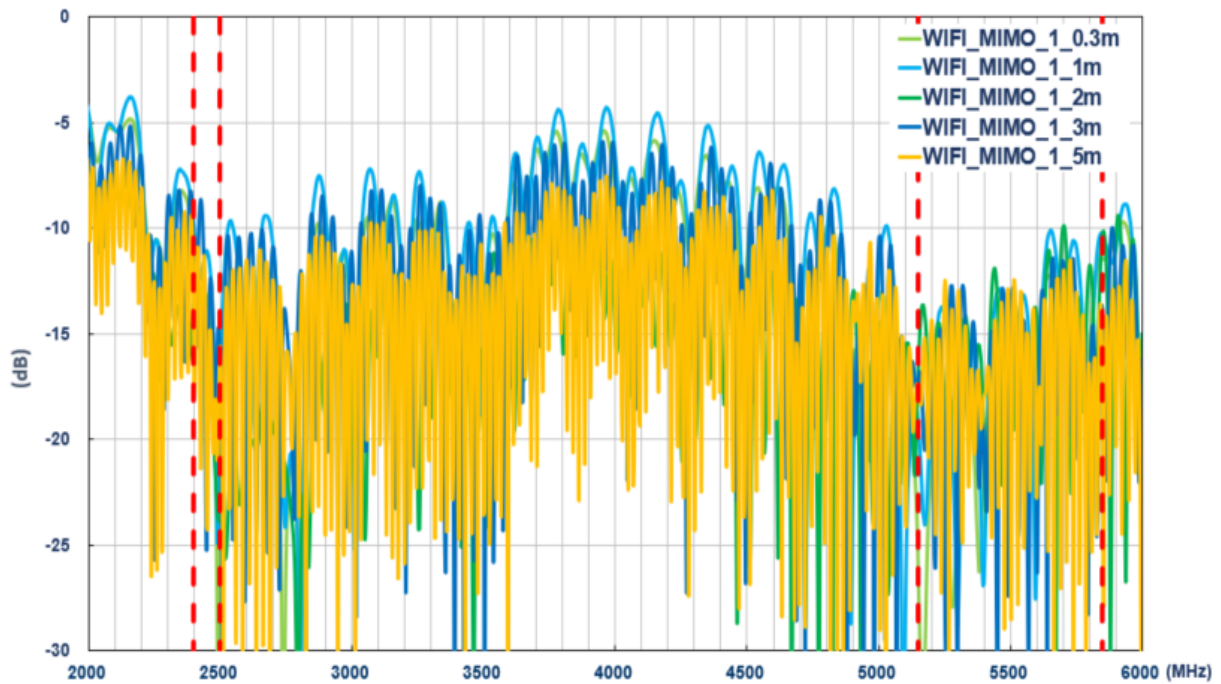


#### Return Loss – LTE MIMO2 Antenna (On 30\*30cm GND)

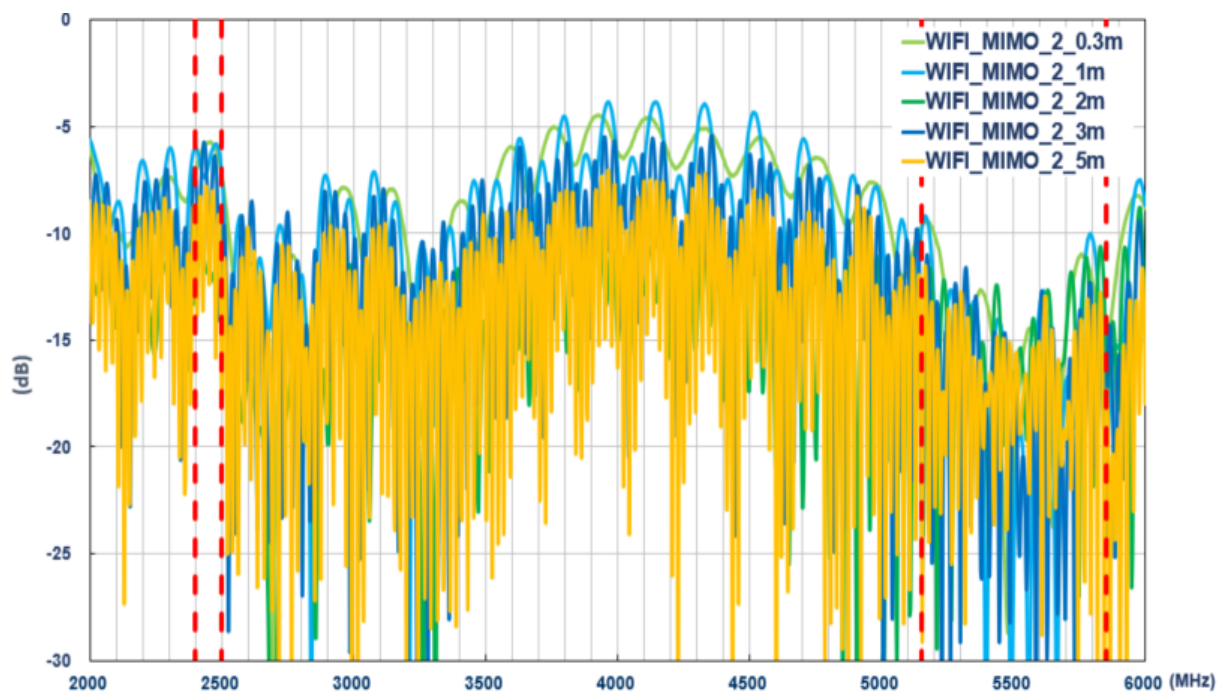




**Return Loss – WI-FI MIMO1 Antenna (On 30\*30cm GND)**

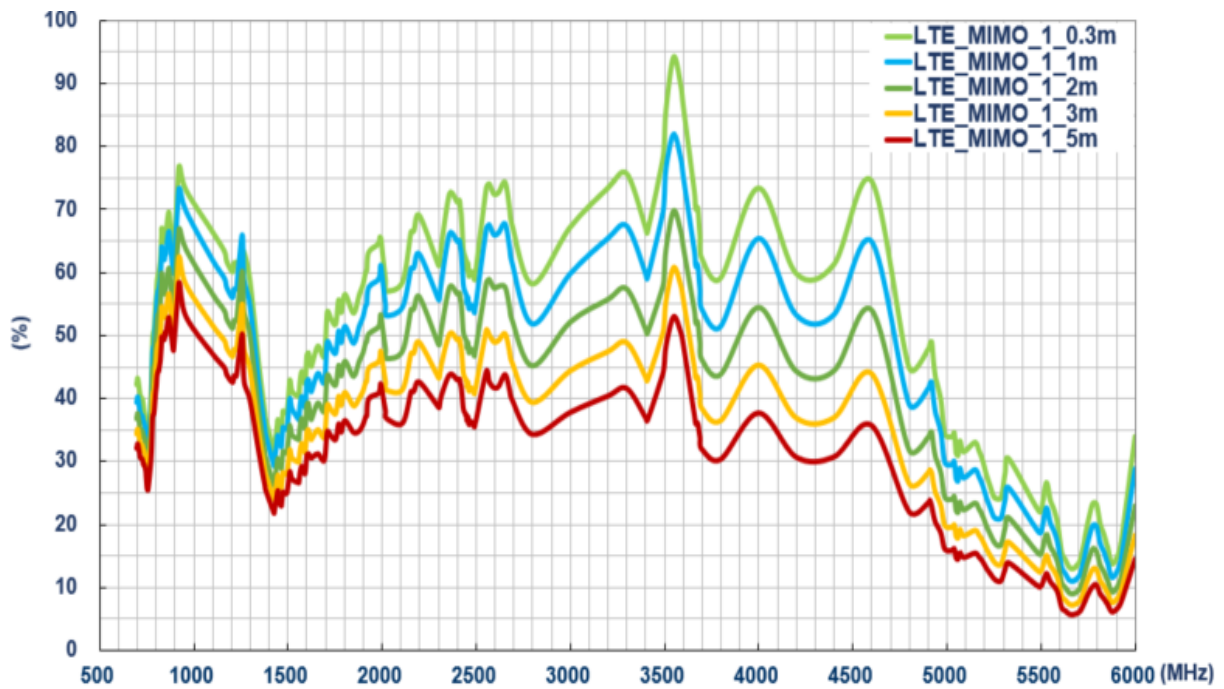


**Return Loss – WI-FI MIMO2 Antenna (On 30\*30cm GND)**

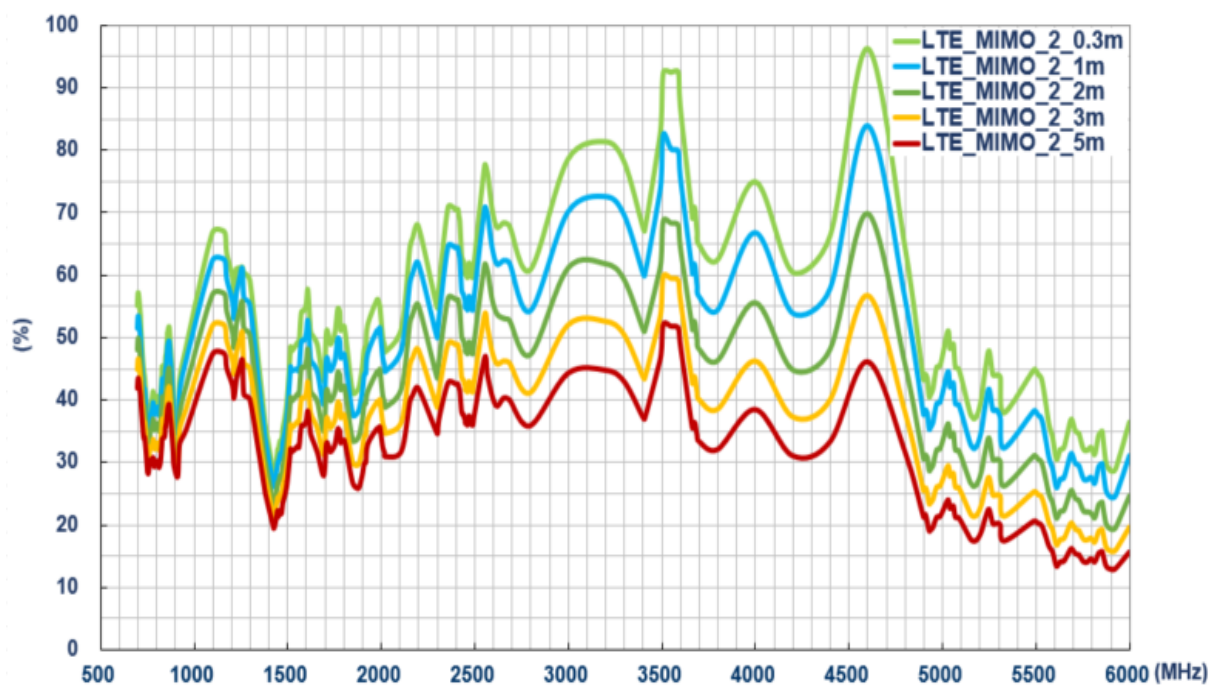


## 7.2. Efficiency

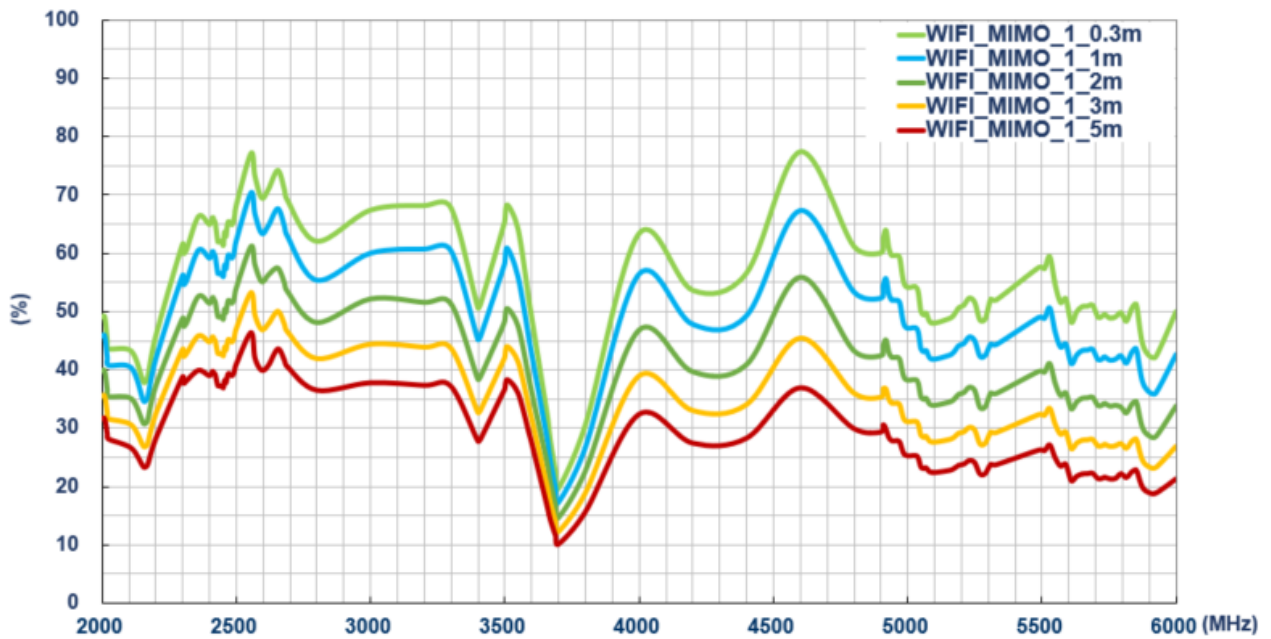
### Efficiency – LTE MIMO1 Antenna (On 30\*30cm GND)



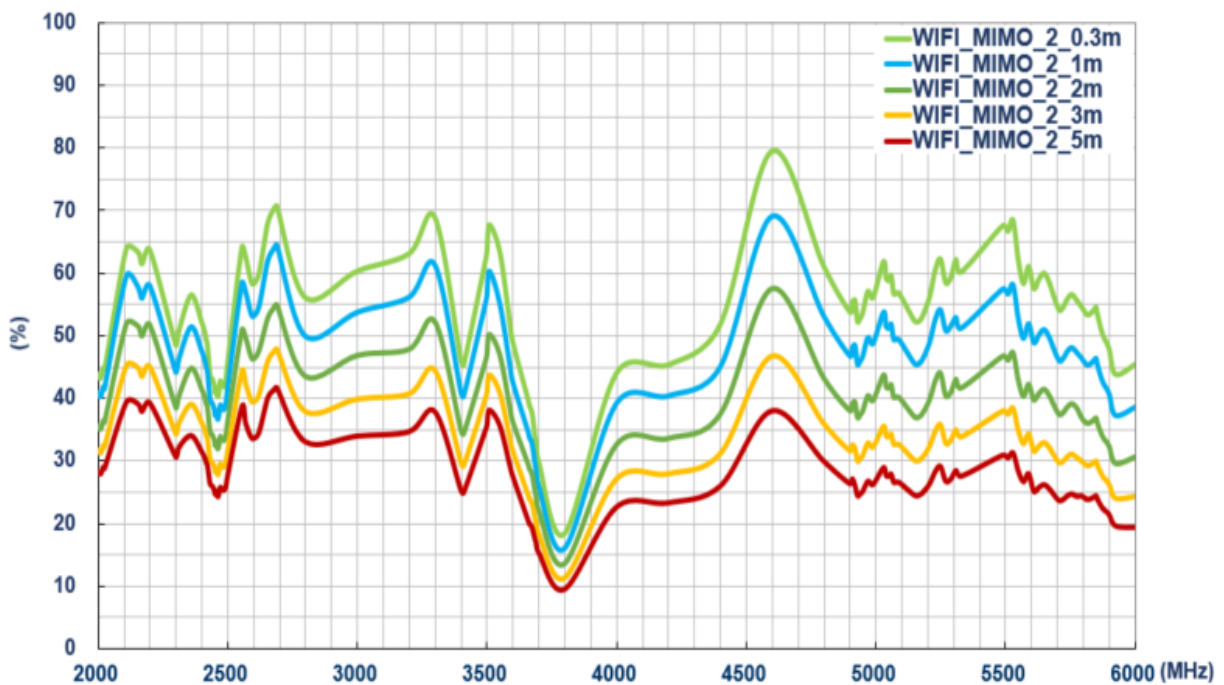
### Efficiency – LTE MIMO2 Antenna (On 30\*30cm GND)



**Efficiency – WI-FI MIMO1 Antenna (On 30\*30cm GND)**

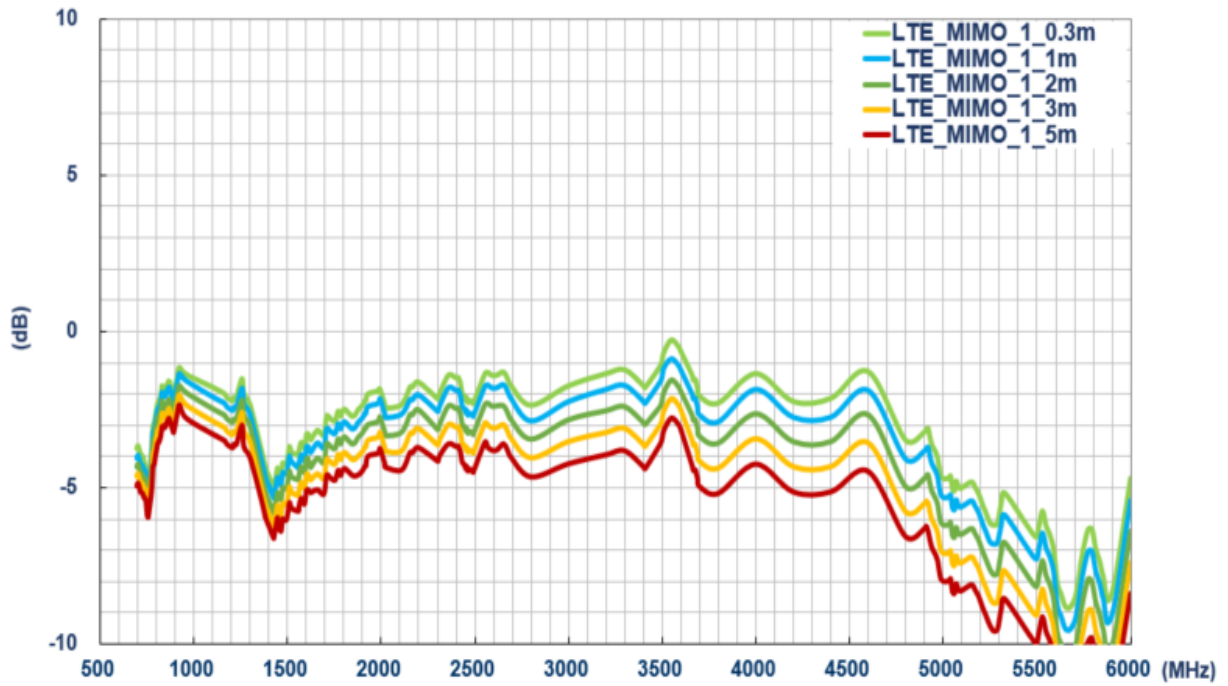


**Efficiency – WI-FI MIMO2 Antenna (On 30\*30cm GND)**

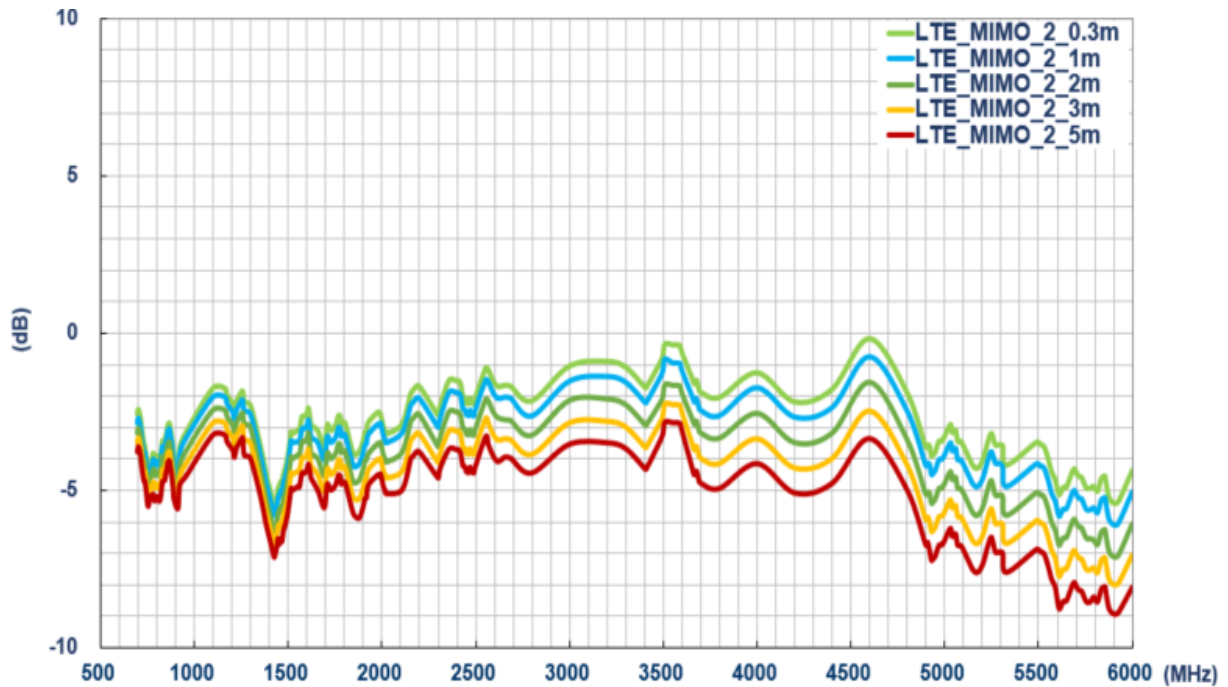


### 7.3. Average Gain

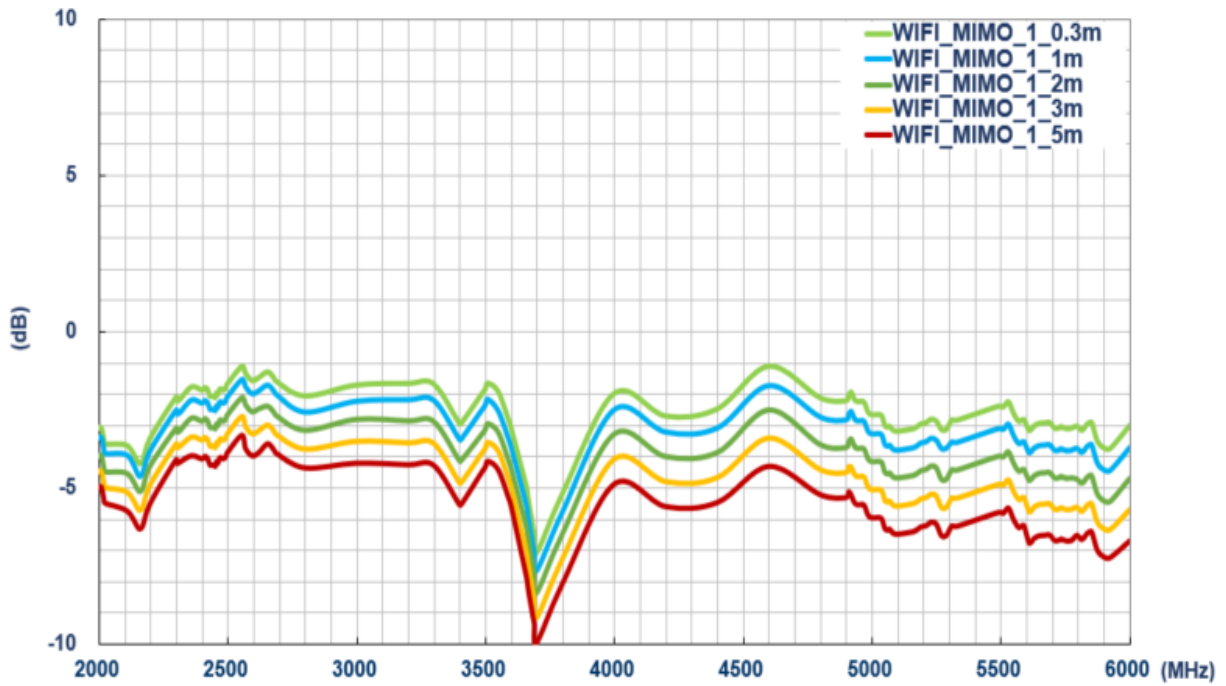
#### Average Gain – LTE MIMO1 Antenna (On 30\*30cm GND)



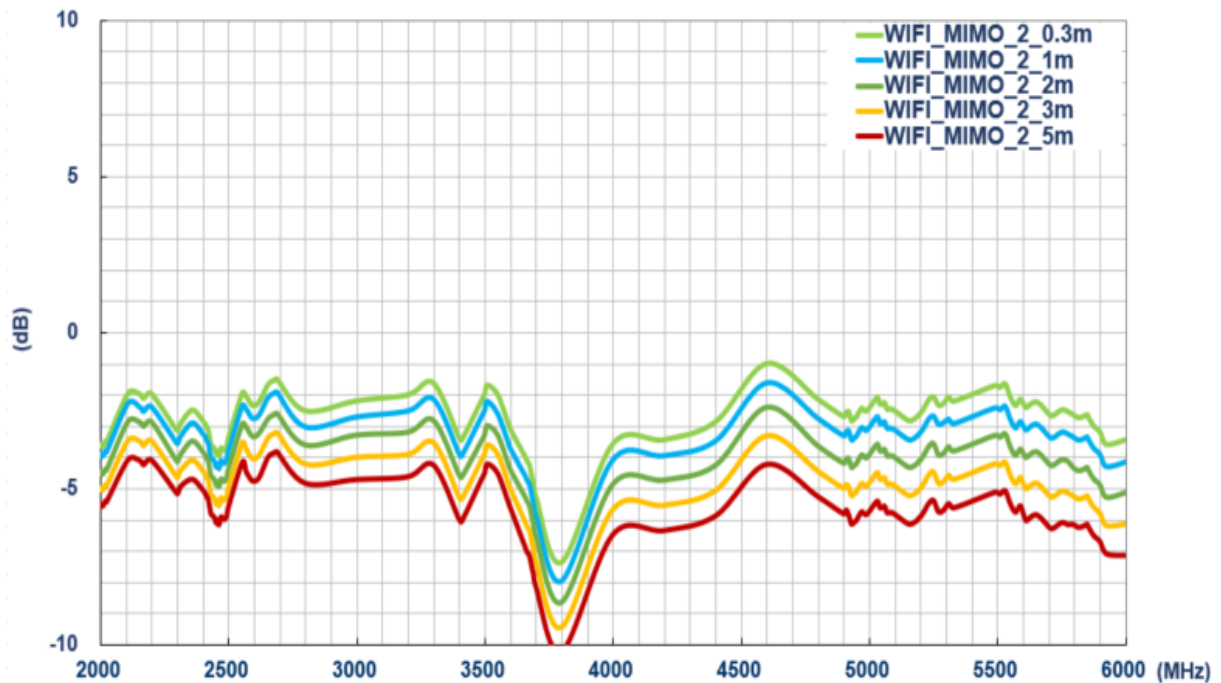
#### Average Gain – LTE MIMO2 Antenna (On 30\*30cm GND)



**Average Gain – WI-FI MIMO1 Antenna (On 30\*30cm GND)**



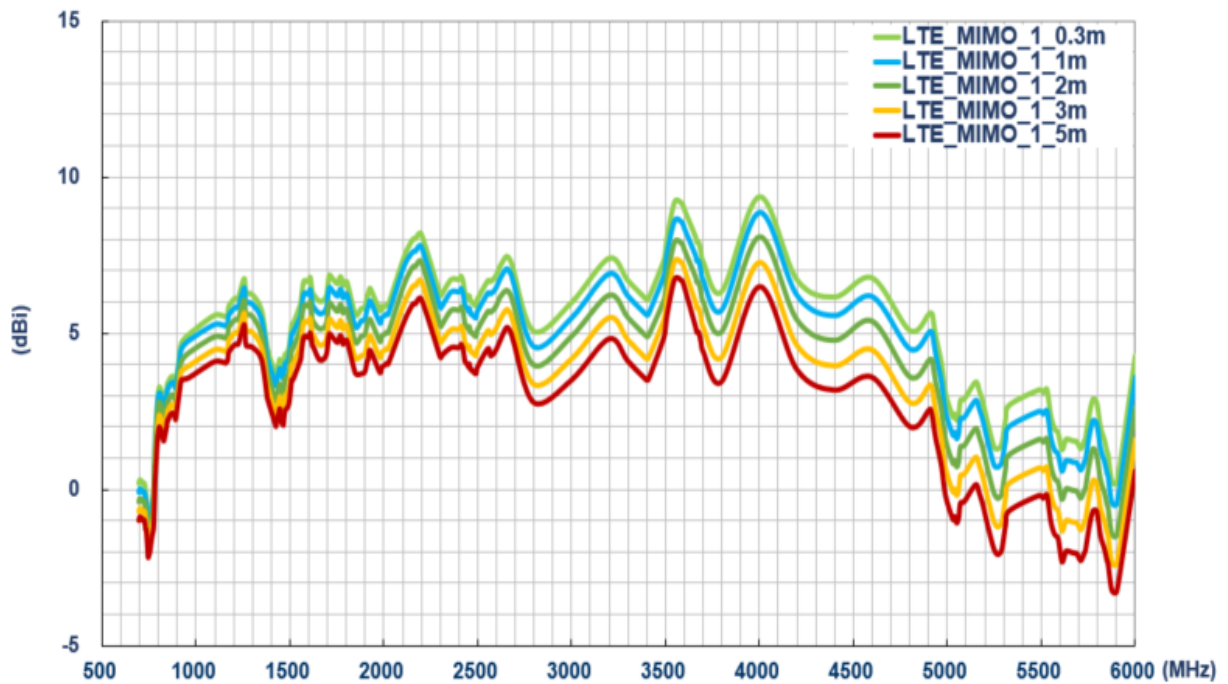
**Average Gain – WI-FI MIMO2 Antenna (On 30\*30cm GND)**



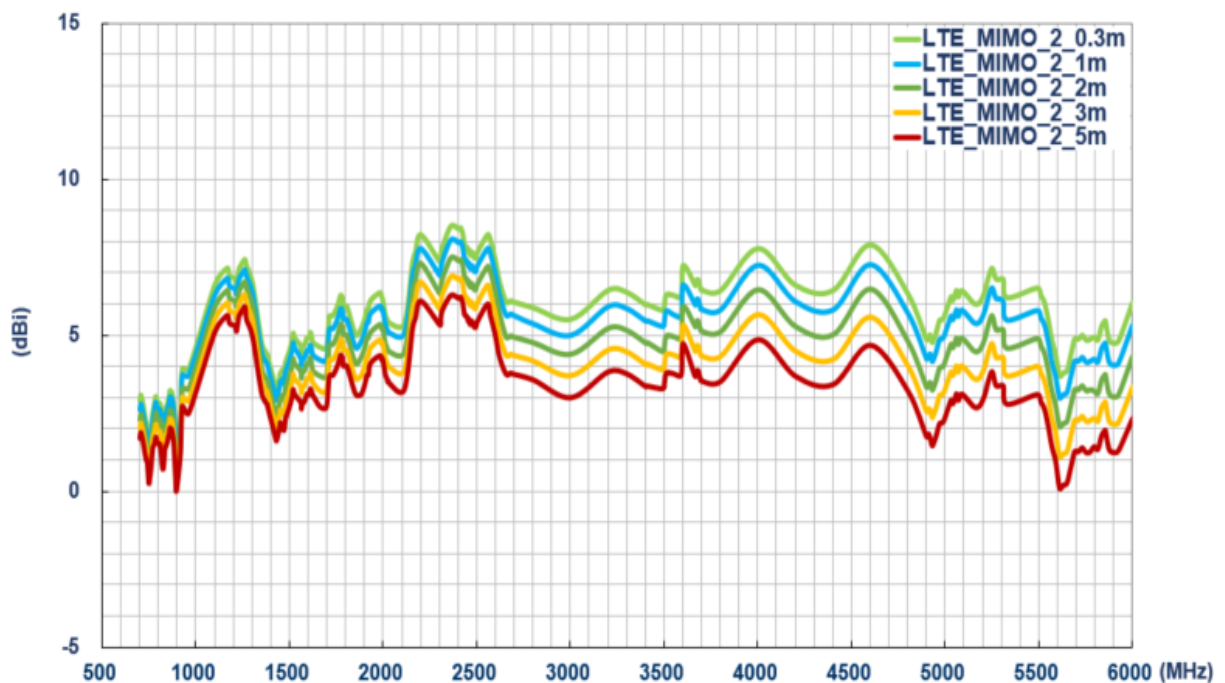


## 7.4. Peak Gain

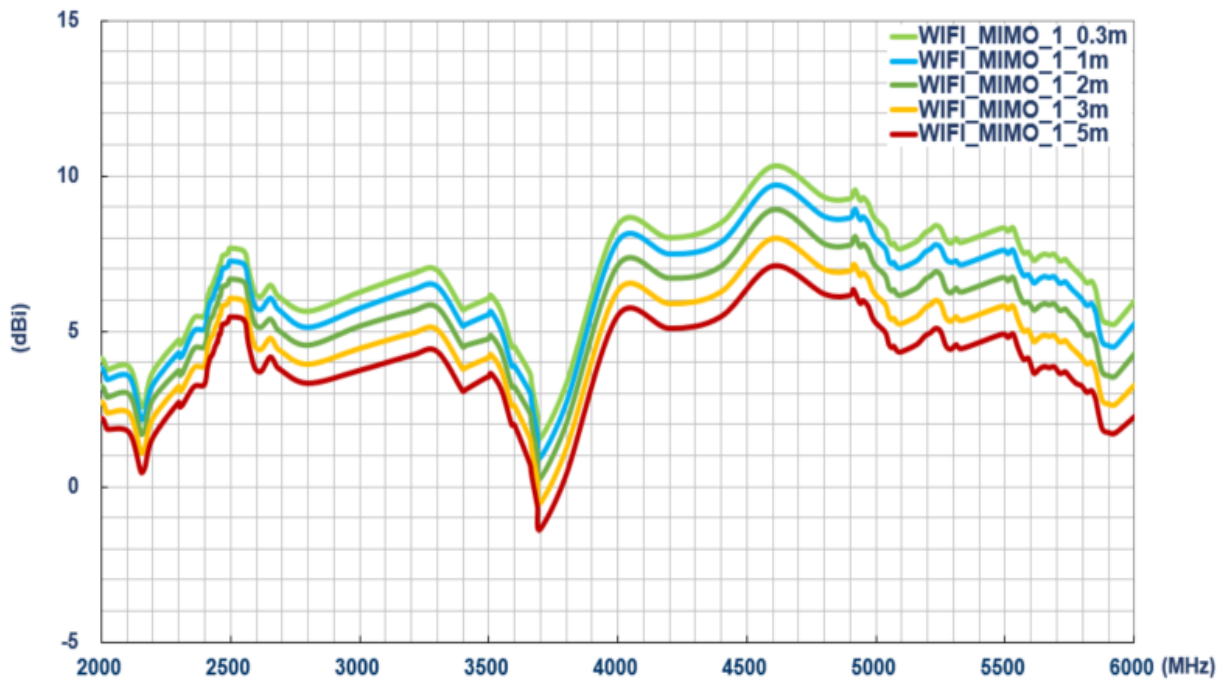
### Peak Gain – LTE MIMO1 Antenna (On 30\*30cm GND)



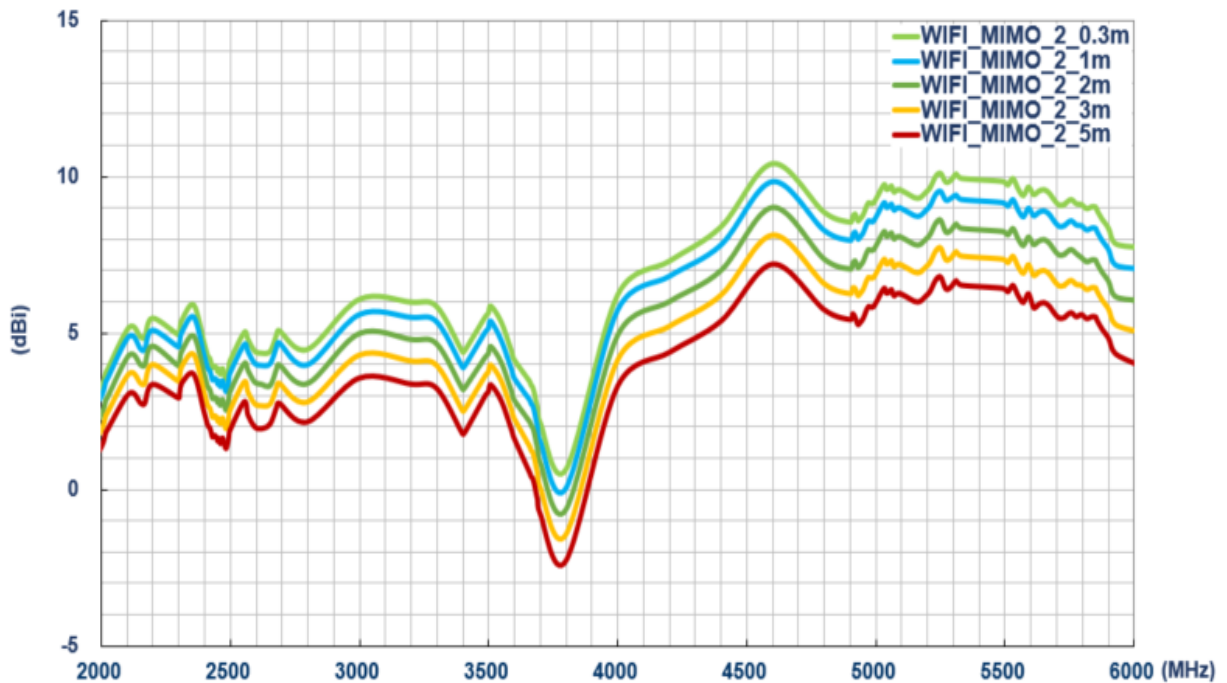
### Peak Gain – LTE MIMO2 Antenna (On 30\*30cm GND)



**Peak Gain – WI-FI MIMO1 Antenna (On 30\*30cm GND)**



**Peak Gain – WI-FI MIMO2 Antenna (On 30\*30cm GND)**



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