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Datasheet

Guardian 4in1 Wall Mount Antenna

Part No:
MA961.W.A.BICG.002.wm

Description:

Guardian 4in1 Wall Mount Antenna 2*LTE MIMO and 2*Wi-Fi MIMO

Features:

- Low-profile Housing
- Mount on Wall or Glass
- 2* 4G/LTE MIMO 698-4000MHz
- 2* Wi-Fi MIMO 2.4GHz/5.8GHz
- Worldwide 4G Bands including fallback to 3G and 2G
- IP67 Waterproof Enclosure
- Dims: 146*134*20mm
- Cables: 3M Low Loss TGC-200 and RG174
- Connectors: SMA(M)/RP-SMA(M)
- Cables and Connectors Customizable
- RoHS & REACH Compliant

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1. Introduction



The MA961 Guardian is a next generation combination antenna. The first panel antenna worldwide designed for IoT Gateway and Router devices. It is a low profile 4in1 wall mount antenna. This unique product delivers powerful worldwide 4G LTE MIMO antenna technology at 698-4000MHz bands and dual band Wi-Fi. It is a heavy-duty, fully IP67 waterproof external M2M antenna for use by RF professionals in IoT Gateway and Routers, HD Video Streaming, Transportation and Remote Monitoring Applications.

This antenna delivers powerful MIMO antenna technology for worldwide 4G LTE bands at 698-4000MHz bands and dual 2.4/5.8GHz Wi-Fi. It enables designers to cover a wide range of technologies by installing a single antenna.

4G wireless applications demand high speed data uplink and downlink. High efficiency and high gain MIMO antennas are necessary to achieve the required signal to noise ratio and throughput required to solve these challenges. Taoglas also takes care to have high isolation among these antennas to prevent self-interference. Low loss cables used to keep efficiency high over long cable lengths.

The housing is made of durable ASA, is IP67 waterproof and comes with a wall mount. The antenna can be mounted internally or externally on a vehicle or building. The MA961 comes with 3 meters TGC-200 cable as standard. Customized cables and connector versions are also available. Contact your regional Taoglas customer support for more information on how to integrate the MA961 or sales support.

2. Specifications

4G/3G/2G MIMO1 Antenna									
Frequency (MHz)	LTE700	GSM850	GSM900	DCS	PCS	UMTS1	LTE2600	LTE3500	
	698~803	824~894	880~960	1710~1880	1850~1990	1920~2170	2490~2690	3300~3600	
Efficiency (%)									
In free space	30cm	80.59	64.37	61.48	67.87	72.91	76.16	47.65	55.23
	1M	76.15	61.48	58.71	61.90	66.50	70.02	43.45	49.00
	2M	71.06	56.46	53.55	55.17	58.52	61.35	37.52	41.47
	3M	65.87	52.33	49.65	49.03	51.74	54.25	32.54	35.03
	5M	56.97	44.54	41.98	38.65	40.59	42.27	24.39	25.12
Average Gain (dB)									
In free space	30cm	-0.95	-1.92	-2.11	-1.69	-1.37	-1.19	-3.42	-2.64
	1M	-1.19	-2.12	-2.31	-2.09	-1.77	-1.55	-3.82	-3.17
	2M	-1.49	-2.49	-2.71	-2.59	-2.33	-2.13	-4.45	-3.89
	3M	-1.82	-2.82	-3.04	-3.10	-2.86	-2.66	-5.08	-4.62
	5M	-2.45	-3.52	-3.77	-4.13	-3.92	-3.75	-6.33	-6.07
Peak Gain (dBi)									
In free space	30cm	3.83	3.32	1.83	4.23	4.23	4.70	4.11	3.36
	1M	3.63	3.12	1.63	3.83	3.83	4.30	3.71	3.36
	2M	3.33	2.82	1.23	3.33	3.33	3.80	3.11	2.66
	3M	3.03	2.42	0.85	2.73	2.73	3.20	2.51	1.86
	5M	2.33	1.72	0.15	1.73	1.73	2.10	1.31	0.46
4G/3G/2G MIMO2 Antenna									
Efficiency (%)									
In free space	30cm	80.00	63.77	59.51	67.36	72.20	76.03	57.82	64.24
	1M	75.66	60.90	56.84	61.43	65.84	69.92	52.74	56.94
	2M	70.61	55.93	51.83	54.75	57.94	61.24	45.51	48.21
	3M	65.44	51.84	48.09	48.66	51.23	54.16	39.45	40.77
	5M	56.55	44.12	40.66	38.36	40.18	42.20	29.58	29.22
Average Gain (dB)									
In free space	30cm	-0.99	-1.96	-2.26	-1.72	-1.42	-1.20	-2.47	-1.93
	1M	-1.23	-2.16	-2.46	-2.12	-1.82	-1.56	-2.87	-2.46
	2M	-1.53	-2.53	-2.86	-2.62	-2.37	-2.14	-3.50	-3.18
	3M	-1.86	-2.86	-3.19	-3.13	-2.91	-2.67	-4.13	-3.91
	5M	-2.49	-3.56	-3.92	-4.16	-3.96	-3.76	-5.38	-5.36
Peak Gain (dBi)									
In free space	30cm	4.86	3.06	2.81	4.41	4.67	4.56	3.95	4.15
	1M	4.66	2.86	2.61	4.01	4.27	4.19	3.55	3.55
	2M	4.36	2.56	2.21	3.51	3.77	3.66	2.95	2.85
	3M	4.06	2.16	1.91	2.99	3.17	3.06	2.35	2.15
	5M	3.36	1.46	1.21	1.99	2.17	2.06	1.15	0.65
Impedance		50Ω							
Polarization		Linear							
VSWR		< 3							
Cable		3 meters TGC-200 standard, fully customizable							
Connector		SMA(M) standard, fully customizable							

ELECTRICAL			
Frequency (MHz)		2400~2500	4900~5850
Efficiency (%)			
MIMO_1	30cm	69.77	59.81
	1M	63.63	51.43
	2M	55.42	41.67
	3M	48.27	33.81
	5M	36.62	22.18
MIMO_2	30cm	70.19	59.69
	1M	64.01	51.32
	2M	55.75	41.57
	3M	48.56	33.71
	5M	36.84	22.12
Average Gain (dBi)			
MIMO_1	30cm	-1.57	-2.27
	1M	-1.97	-2.92
	2M	-2.57	-3.84
	3M	-3.17	-4.75
	5M	-4.37	-6.58
MIMO_2	30cm	-1.54	-2.25
	1M	-1.94	-2.91
	2M	-2.54	-3.82
	3M	-3.14	-4.73
	5M	-4.34	-6.56
Peak Gain (dBi)			
MIMO_1	30cm	4.87	4.95
	1M	4.37	4.26
	2M	3.77	3.36
	3M	3.17	2.46
	5M	1.97	0.66
MIMO_2	30cm	4.93	5.09
	1M	4.43	4.39
	2M	3.83	3.49
	3M	3.23	2.59
	5M	2.03	0.79
Impedance	50Ω		
Polarization	Linear		
VSWR	< 3		
Cable	3 meter TGC-200 standard, fully customizable		
Connector	SMA(M) standard, fully customizable		

MECHANICAL	
Antenna Dimensions	146*134*20mm
Casing	ABS+PC
Base and thread	Nickel Plated Aluminium
Weight	586g
Ingress Protection Rating	IP67
ENVIRONMENTAL	
Operation Temperature	-40°C to 85°C
Storage Temperature	-40°C to 90°C
Humidity	Non-condensing 65°C 95% RH

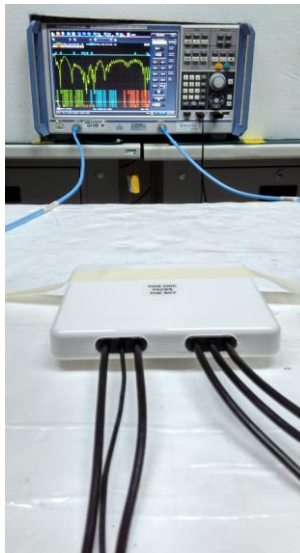
LTE Bands				
Band Number	LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA			
	Uplink	Downlink	MIMO 1	MIMO 2
1	UL: 1920 to 1980	DL: 2110 to 2170	✓	✓
2	UL: 1850 to 1910	DL: 1930 to 1990	✓	✓
3	UL: 1710 to 1785	DL: 1805 to 1880	✓	✓
4	UL: 1710 to 1755	DL: 2110 to 2155	✓	✓
5	UL: 824 to 849	DL: 869 to 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 greater than 20% efficiency

3. Antenna Characteristics

3.1 LTE_MIMO/Wi-Fi_MIMO Antenna

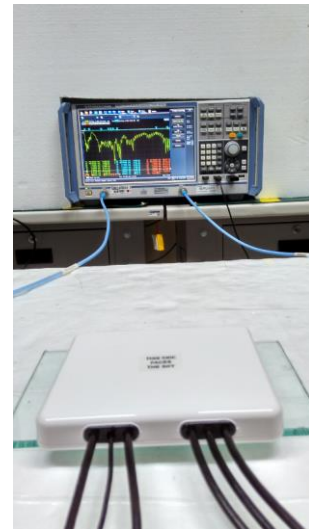
3.1.1 Test Setup



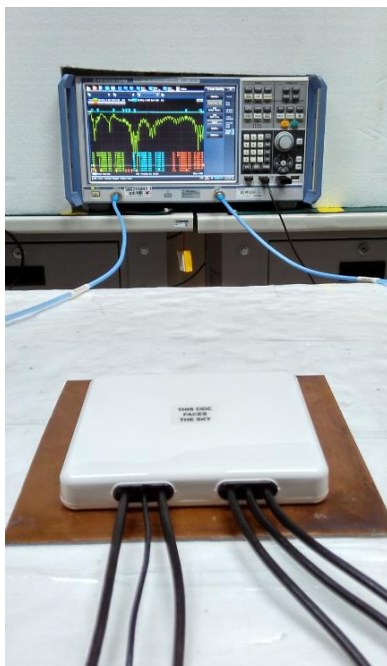
Free space



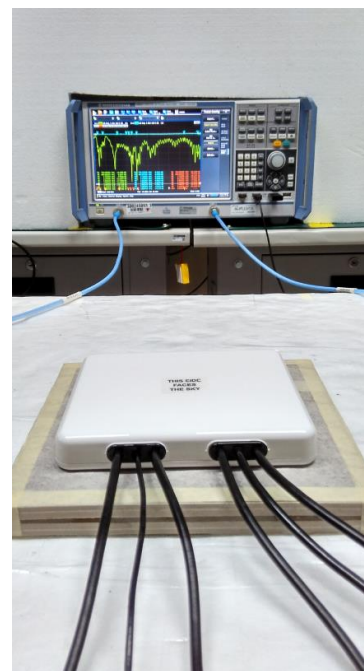
ABS



Glass



Metal



Wall

3.1.2 LTE_1 Antenna Return Loss

Performance in different environments with 1 meter cable length

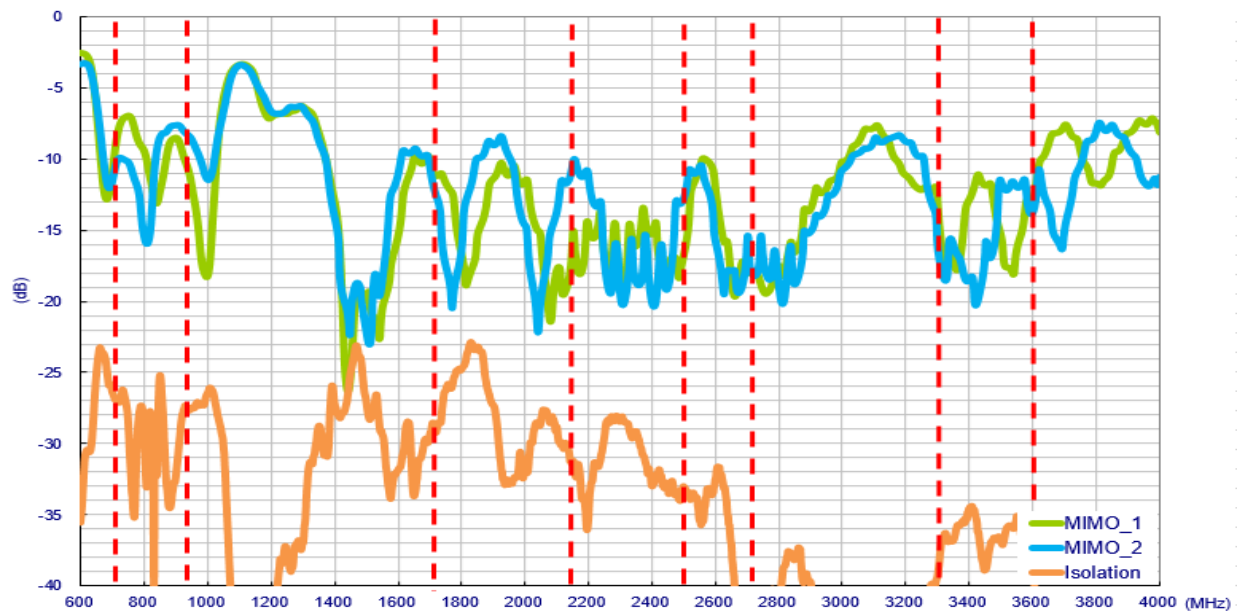


Figure 1. Return loss of MA961 LTE MIMO antenna in free space

3.1.3 LTE Antenna Efficiency

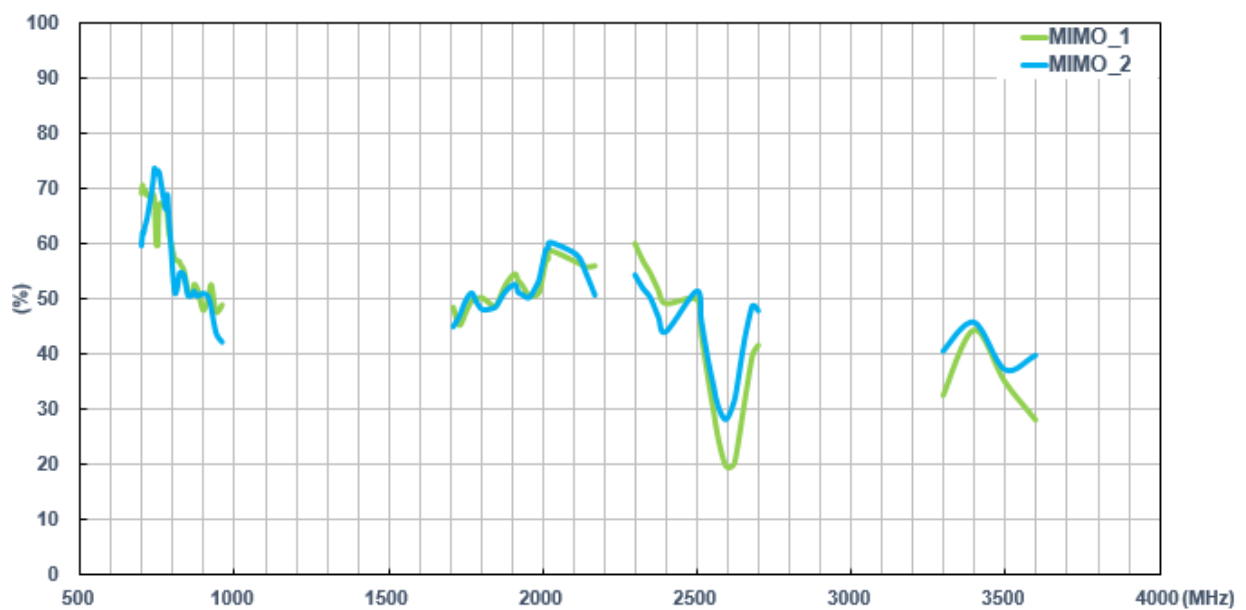


Figure 2. Efficiency of MA961 LTE MIMO antenna in free space

3.1.4 LTE Antenna Average Gain

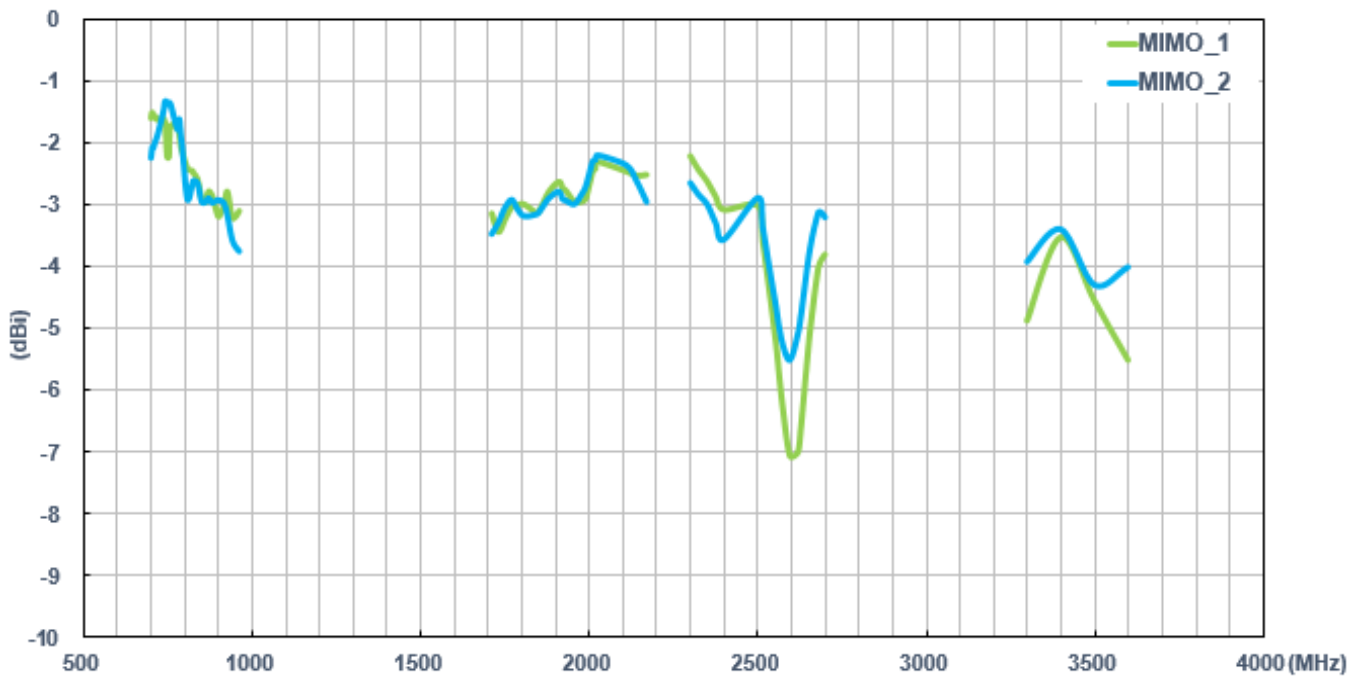


Figure 3. Average gain of MA961 LTE MIMO antenna in free space

3.1.5 LTE Antenna Peak Gain

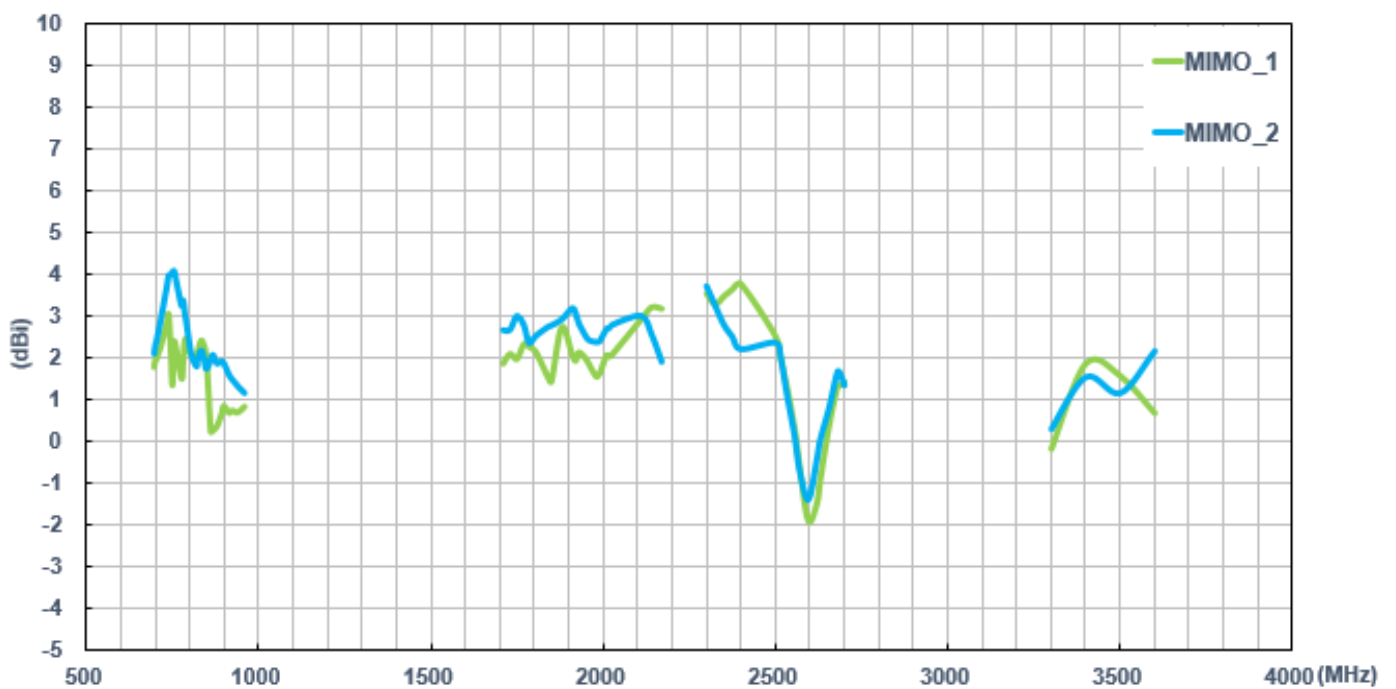


Figure 4. Peak gain of MA961 LTE MIMO antenna in the free space

3.2 Wi-Fi MIMO Antenna

3.2.1 Wi-Fi Antenna Return Loss and Isolation with 3-meter cable length

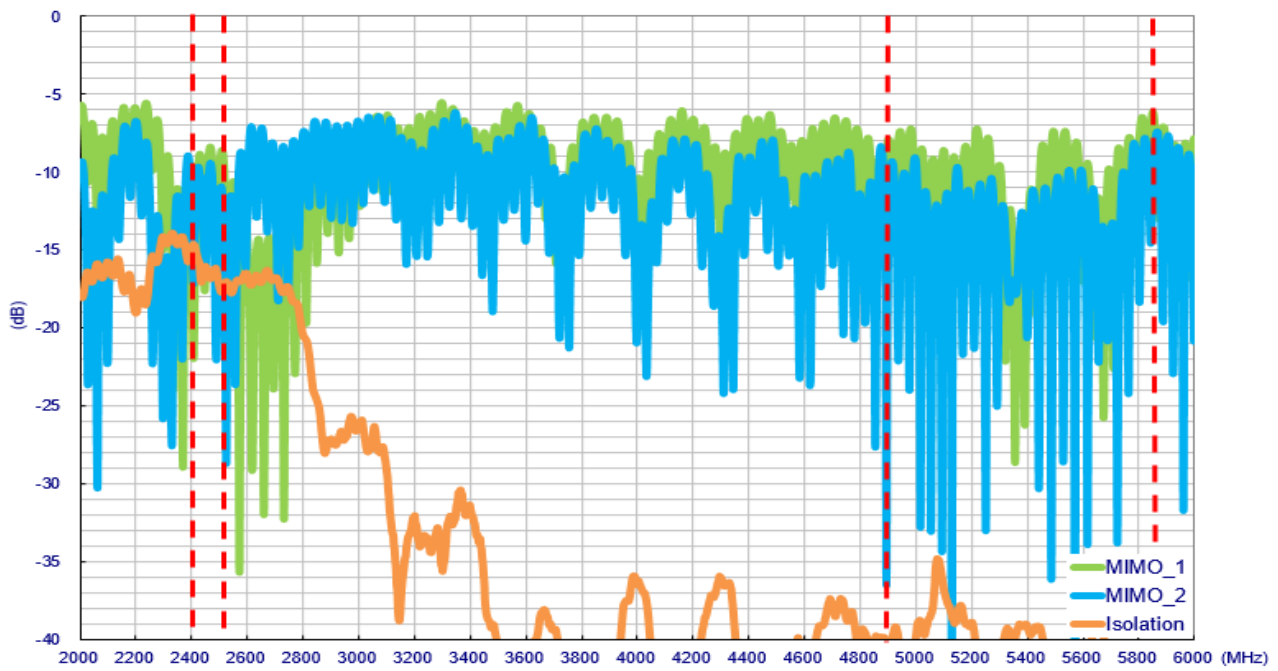


Figure 5. Return loss of MA961 Wi-Fi MIMO antenna in free space

3.2.2 Wi-Fi Antenna Efficiency

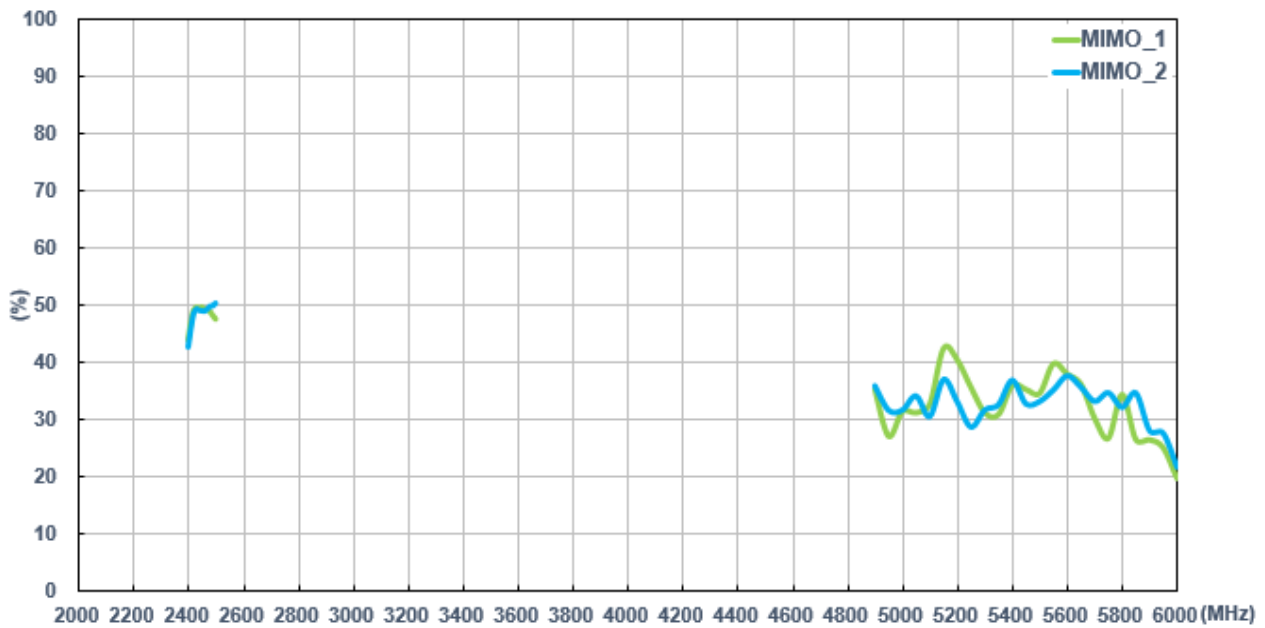


Figure 6. Efficiency of MA961 Wi-Fi MIMO antenna in free space

3.2.3 Wi-Fi Antenna Average Gain

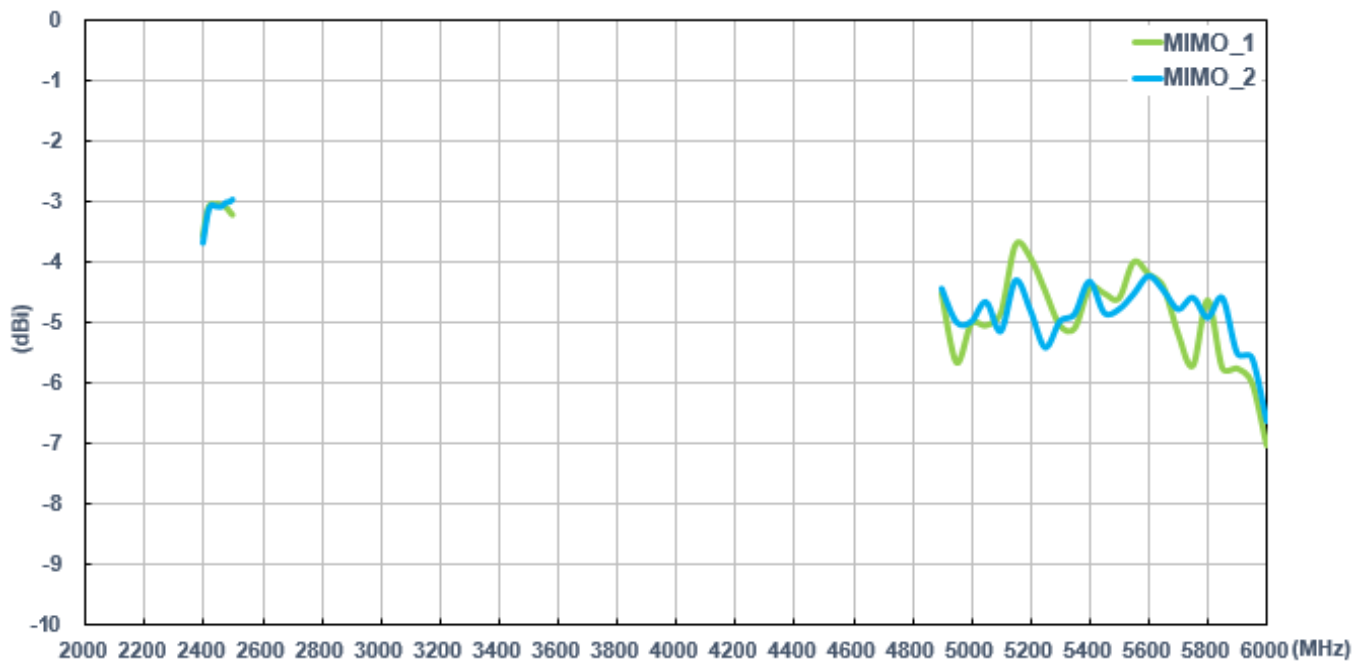


Figure 7. Average gain of MA961 Wi-Fi MIMO antenna in free space

3.2.4 Wi-Fi Antenna Peak Gain

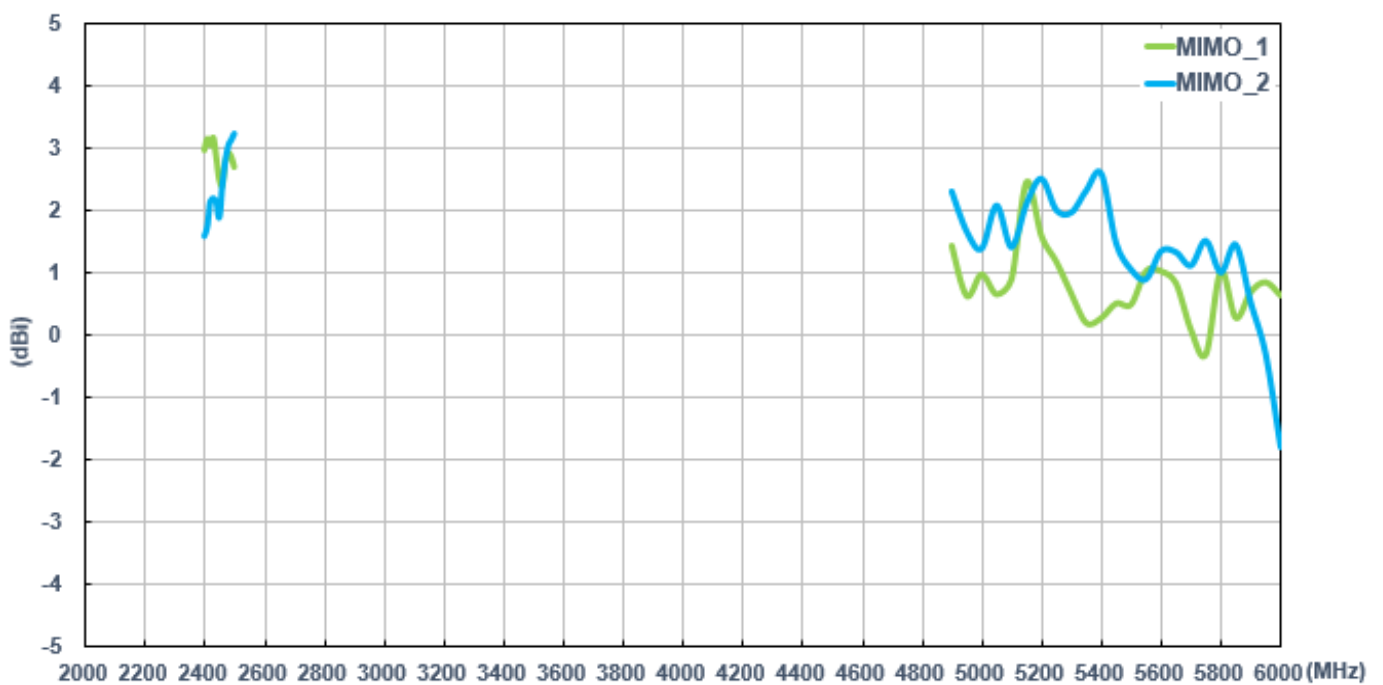
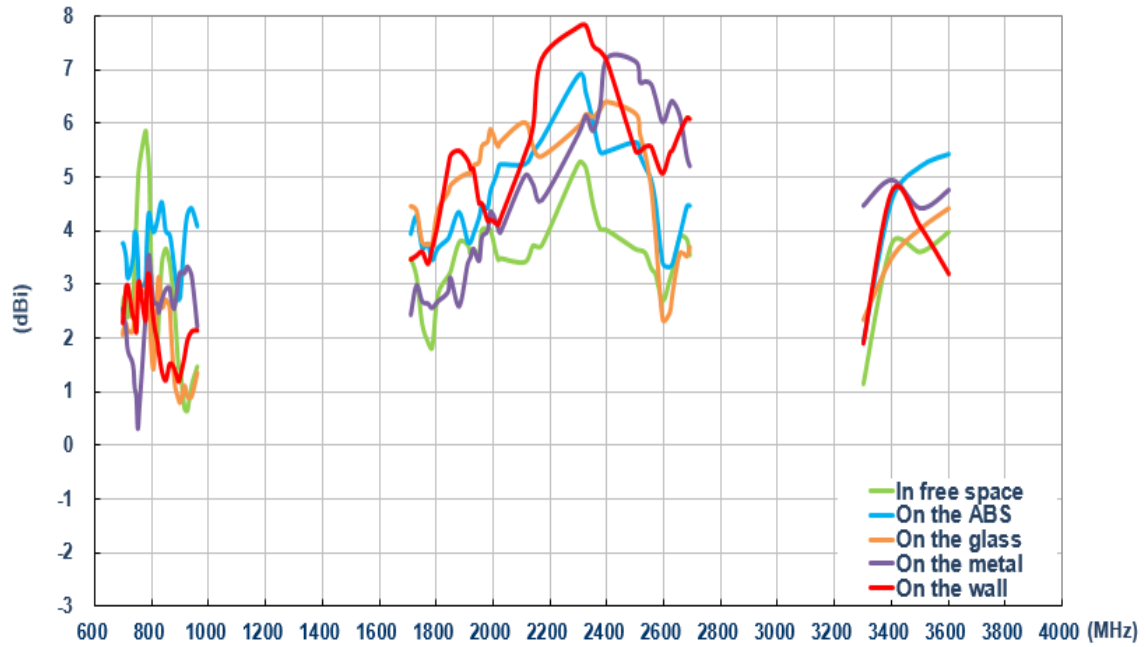


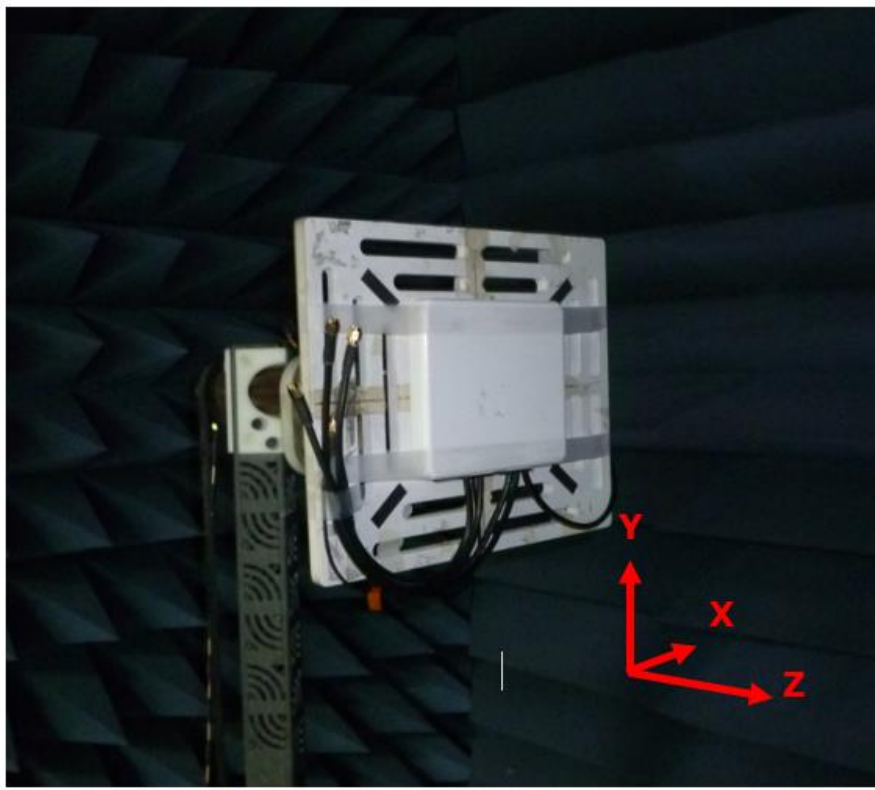
Figure 8. Peak gain of MA961 Wi-Fi MIMO antenna in the free space

3.2.5 LTE_2 Antenna Peak Gain

Performance in different environments with 1 meter cable length



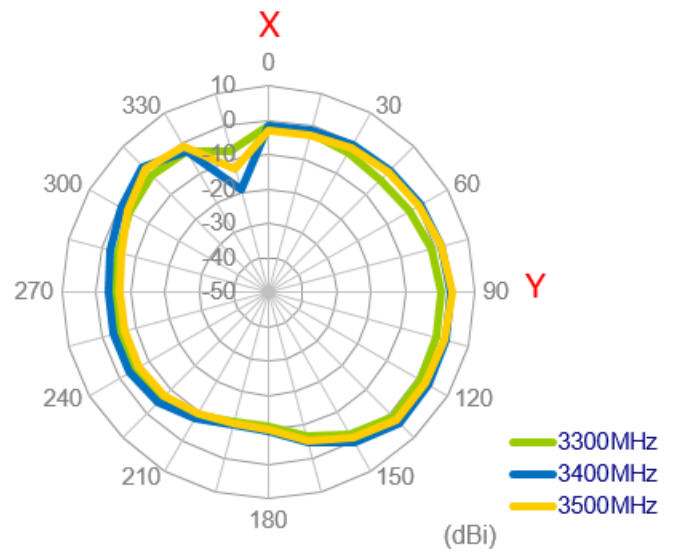
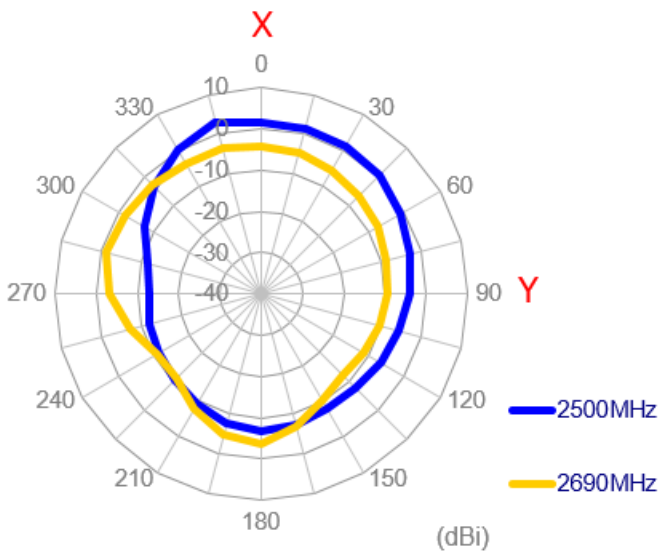
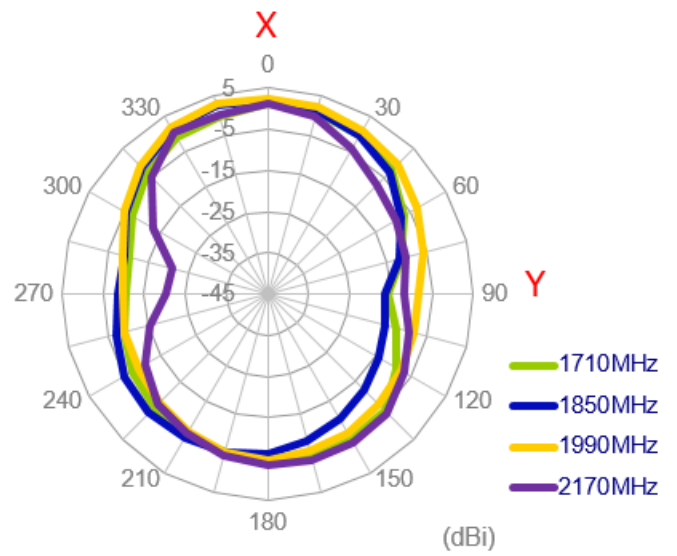
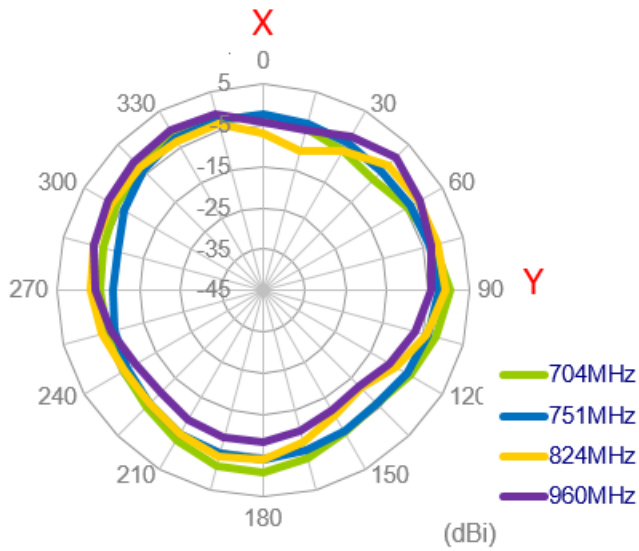
3.3 Test Setup for Antenna Radiation Pattern (ETS Anechoic chamber)



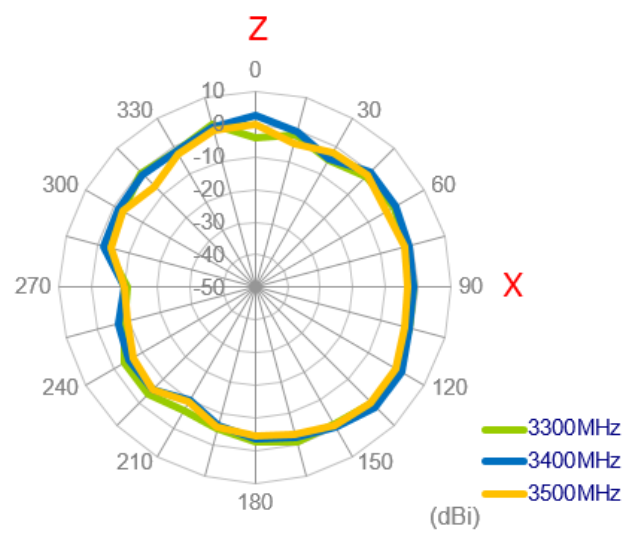
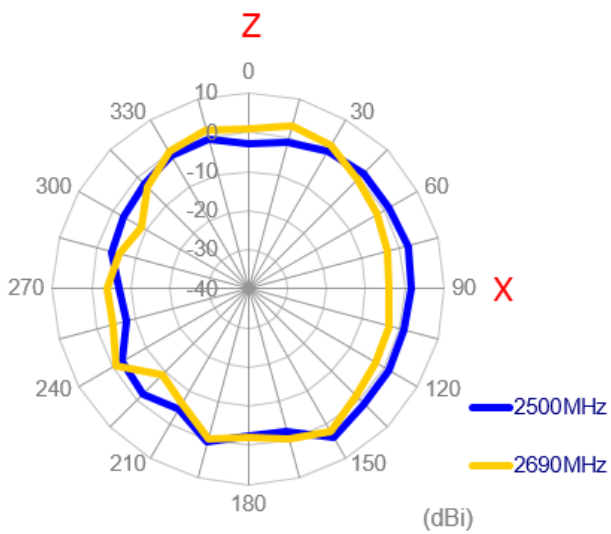
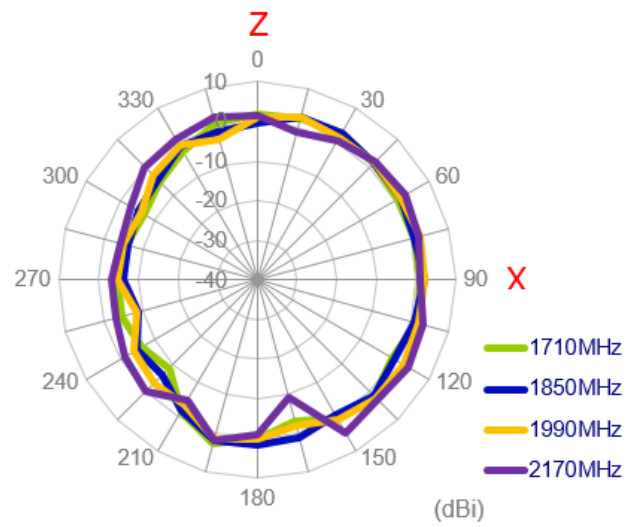
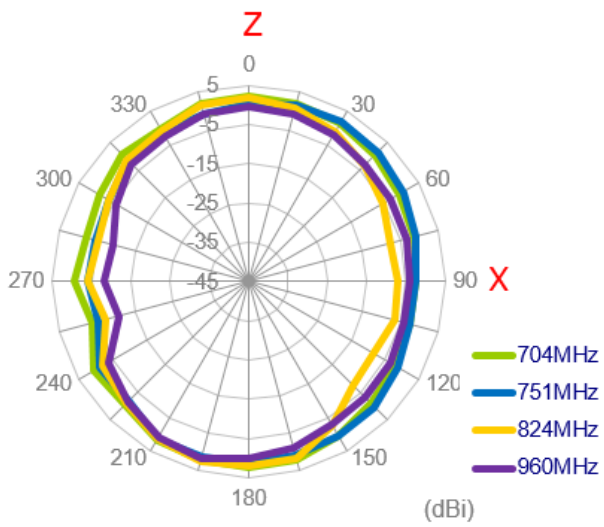
Free space

3.3.1 2D Radiation Patterns (LTE_MIMO1 with 3M cable length in free space)

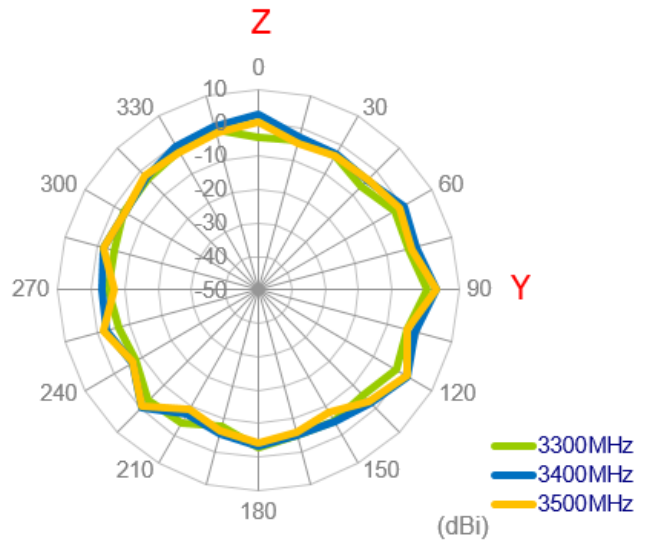
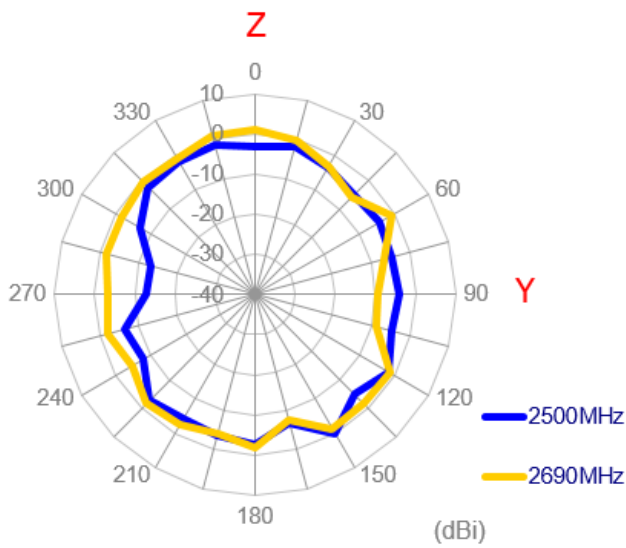
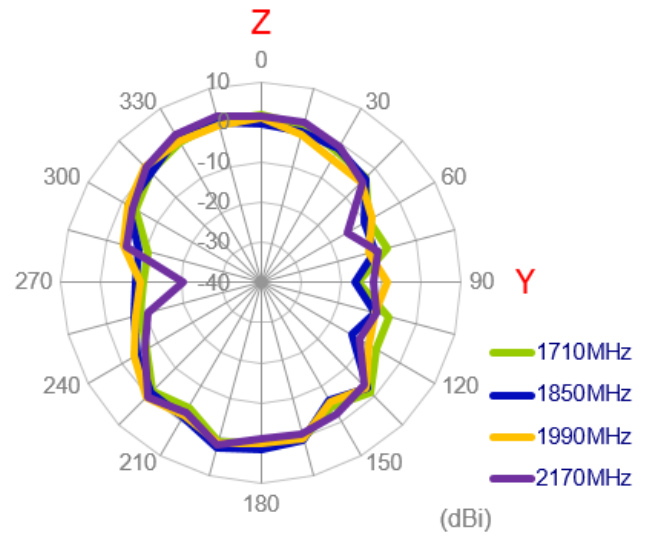
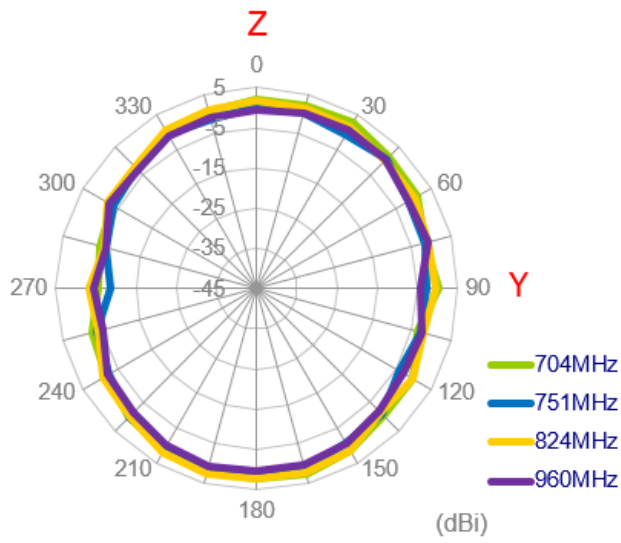
XY Plane



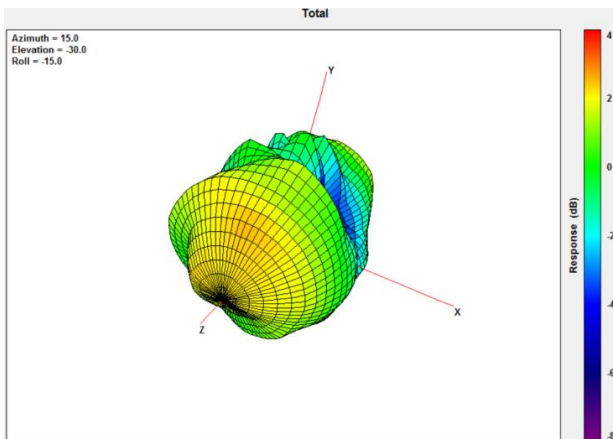
XZ Plane



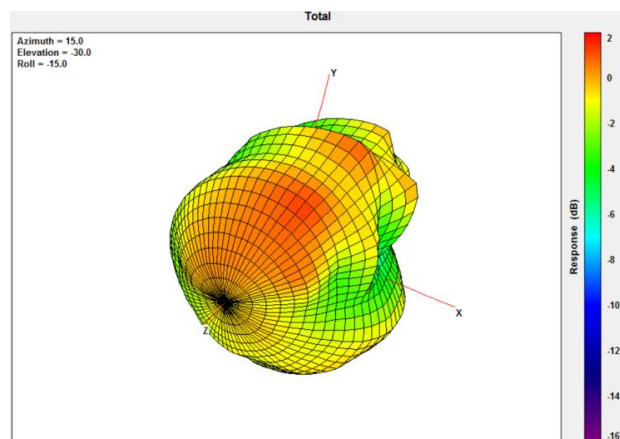
YZ Plane



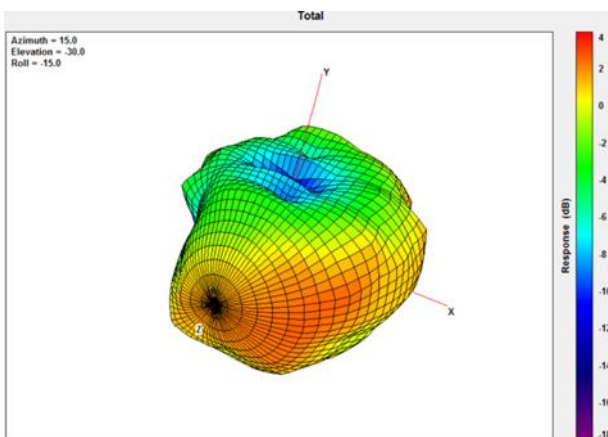
3.3.2 3D Radiation Patterns (LTE_MIMO1 with 3M cable length in free space)



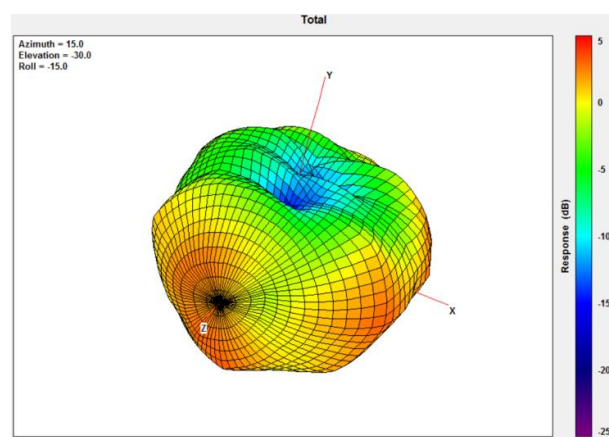
704MHz



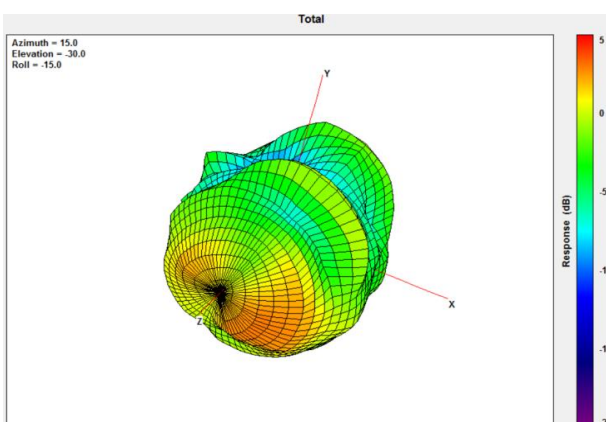
960MHz



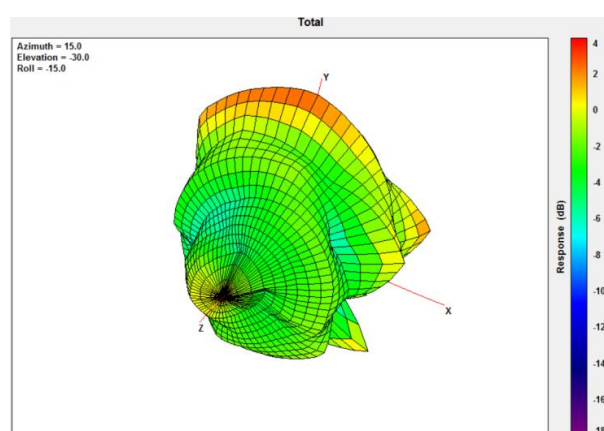
1710MHz



2170MHz



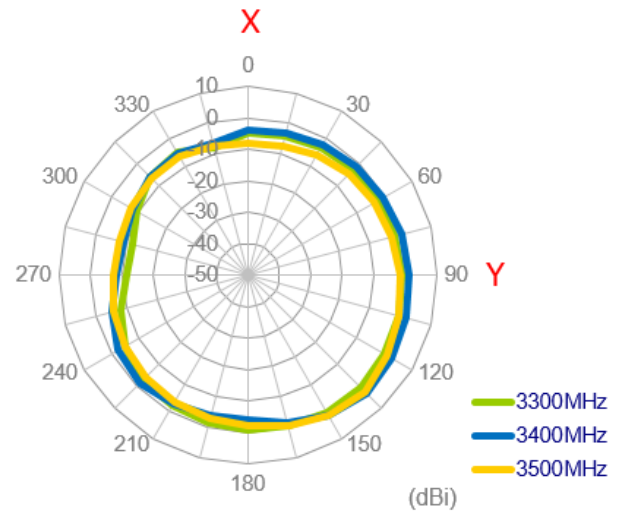
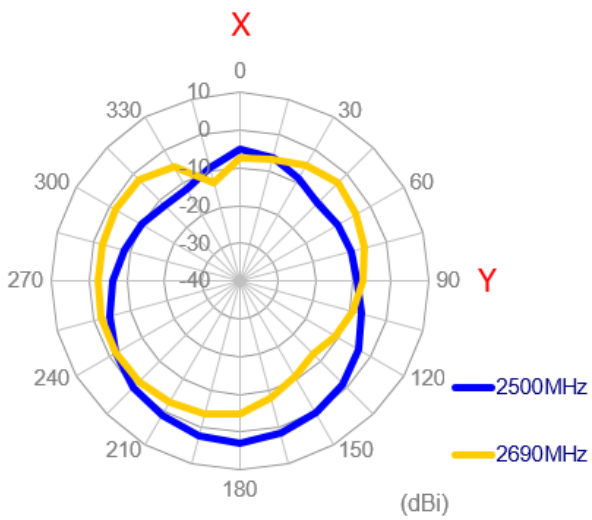
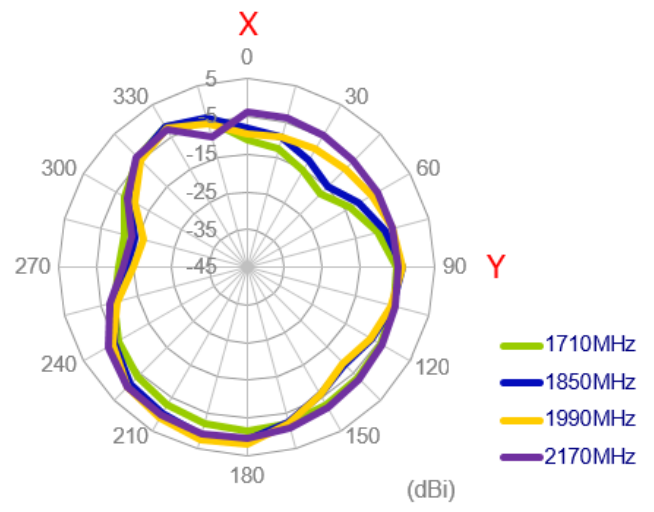
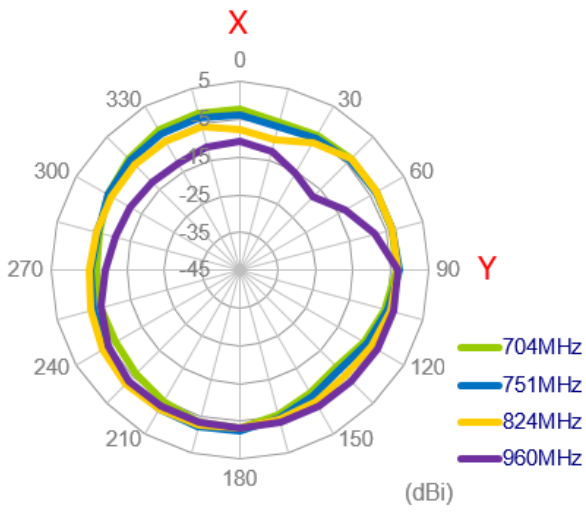
2690MHz



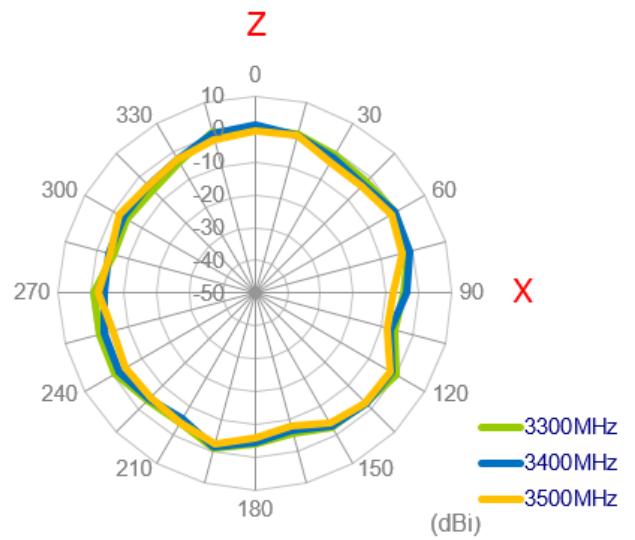
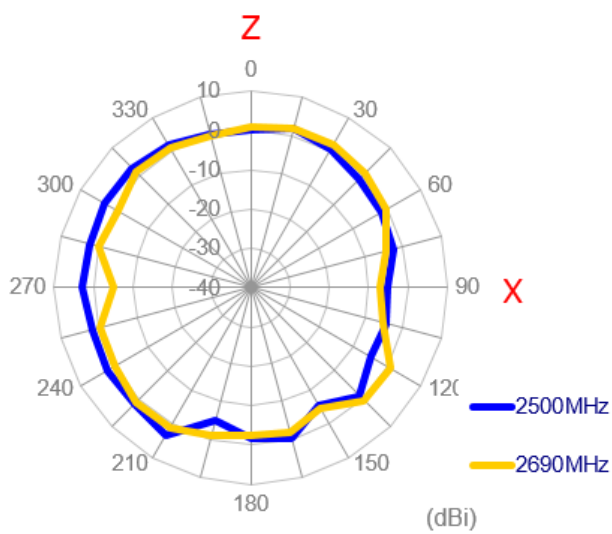
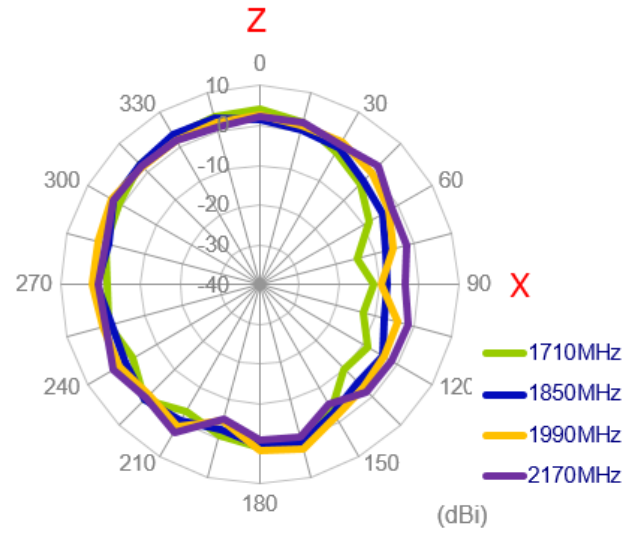
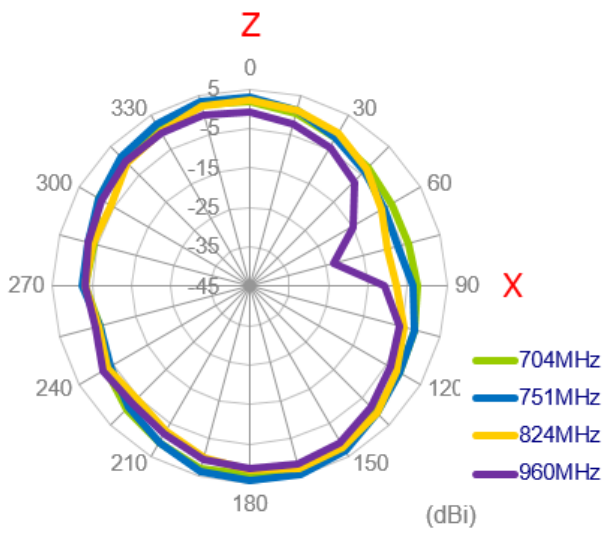
3500MHz

3.3.3 2D Radiation Patterns (LTE_MIMO2 with 3M cable length in free space)

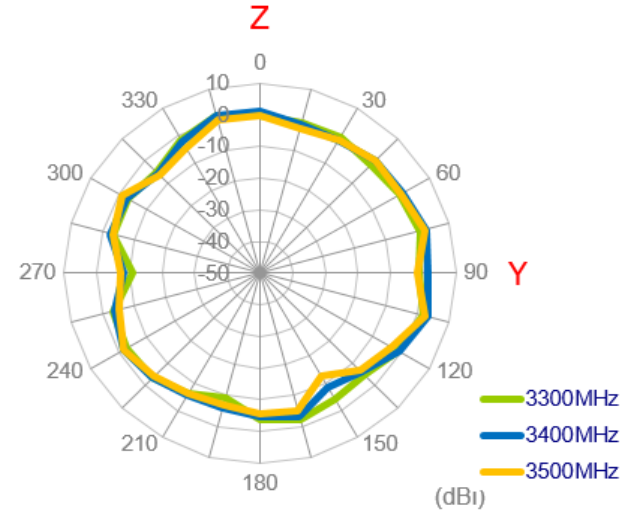
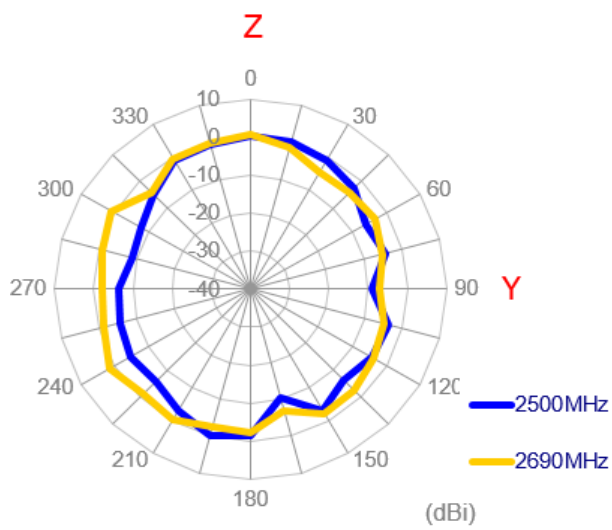
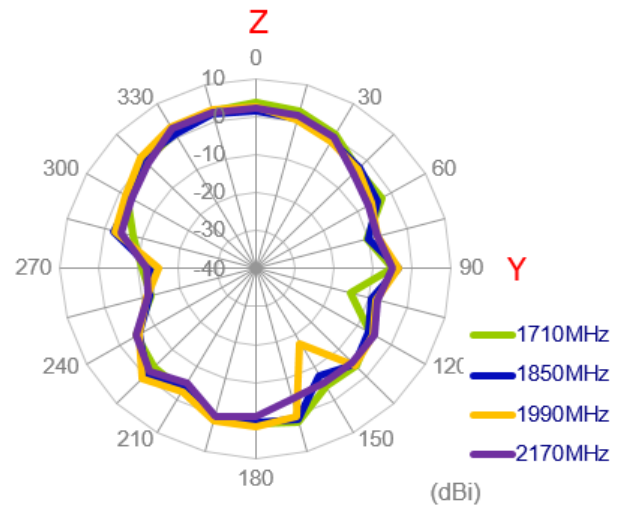
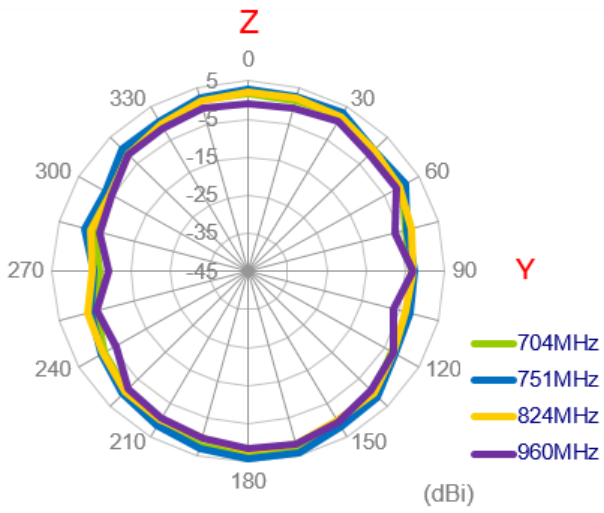
XY Plane



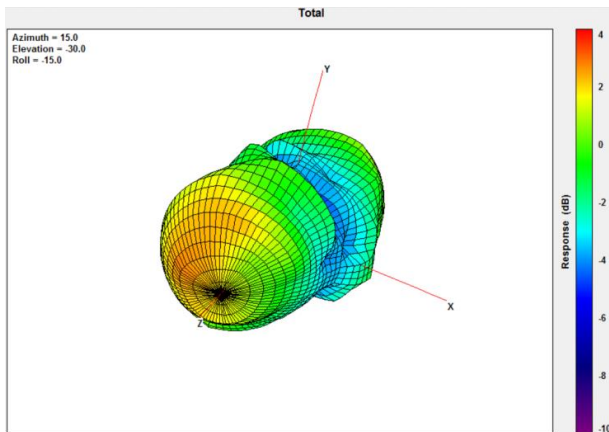
XZ Plane



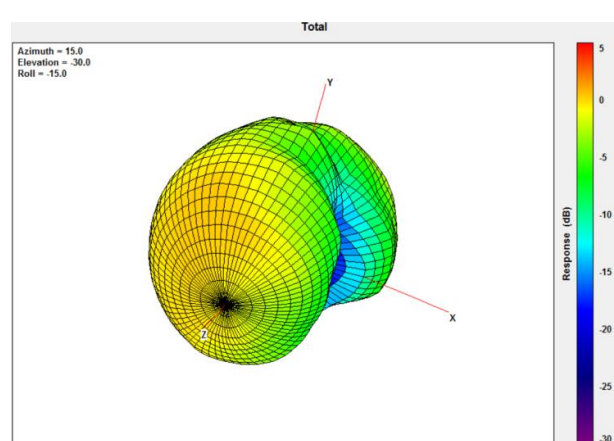
YZ Plane



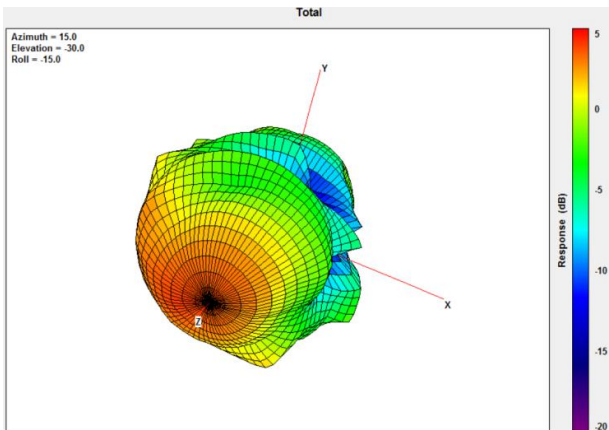
3.2.4 3D Radiation Patterns (LTE_MIMO2 with 1M cable length in free space)



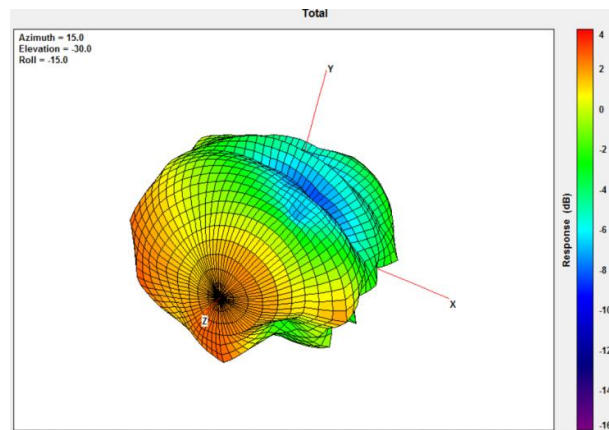
704MHz



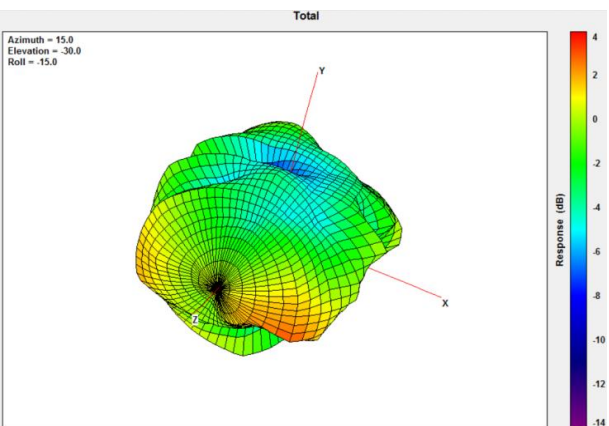
960MHz



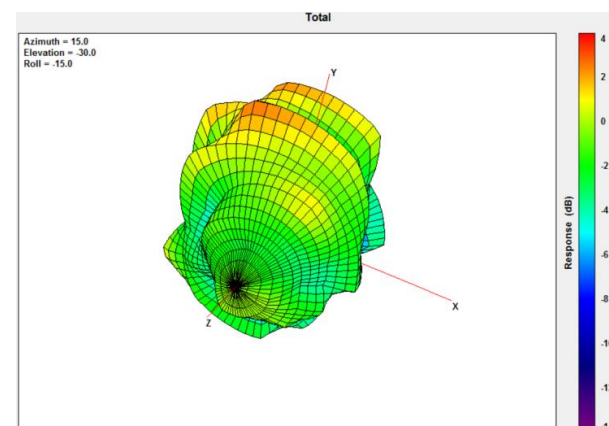
1710MHz



2170MHz



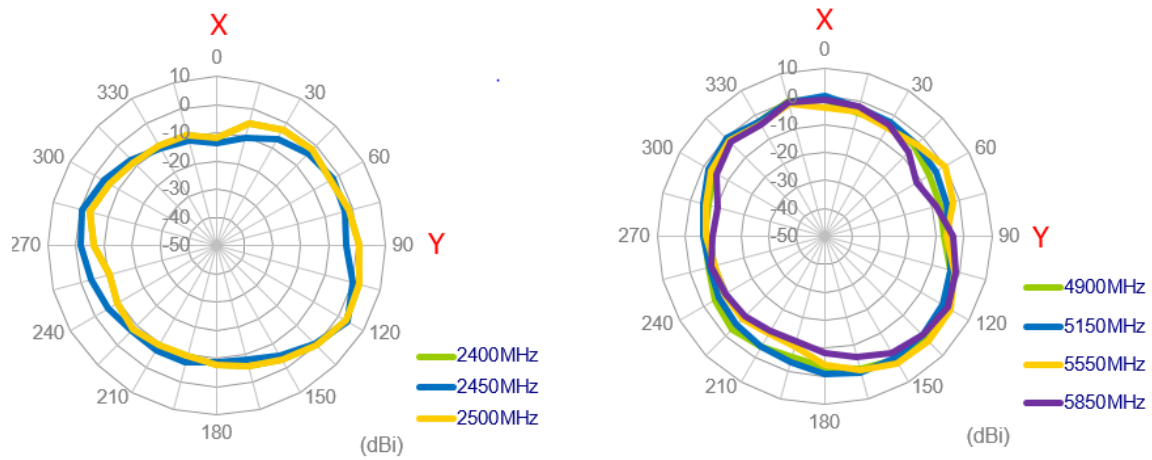
2690MHz



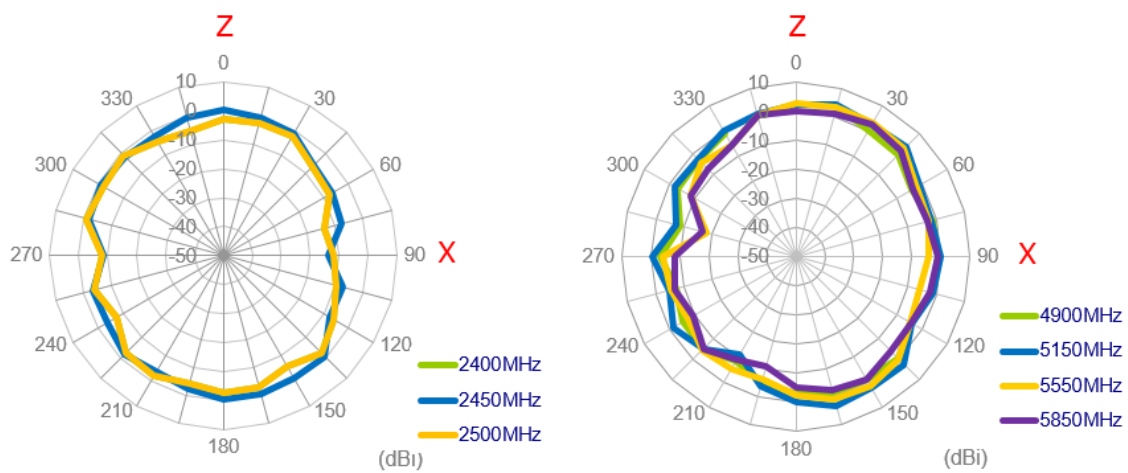
3500MHz

3.2.5 2D Radiation Patterns (LTE_MIMO1 with 3M cable length in free space)

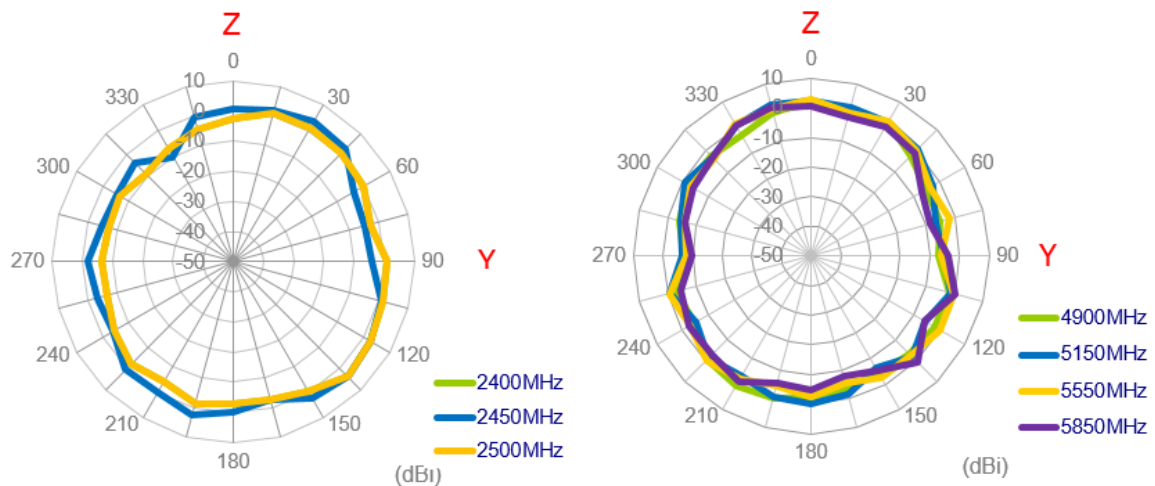
XY Plane



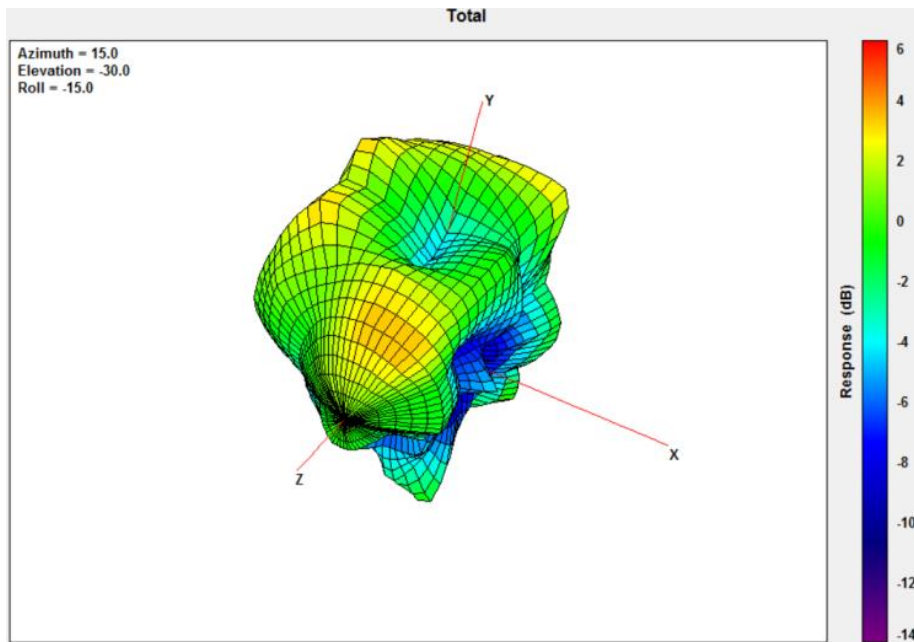
XZ Plane



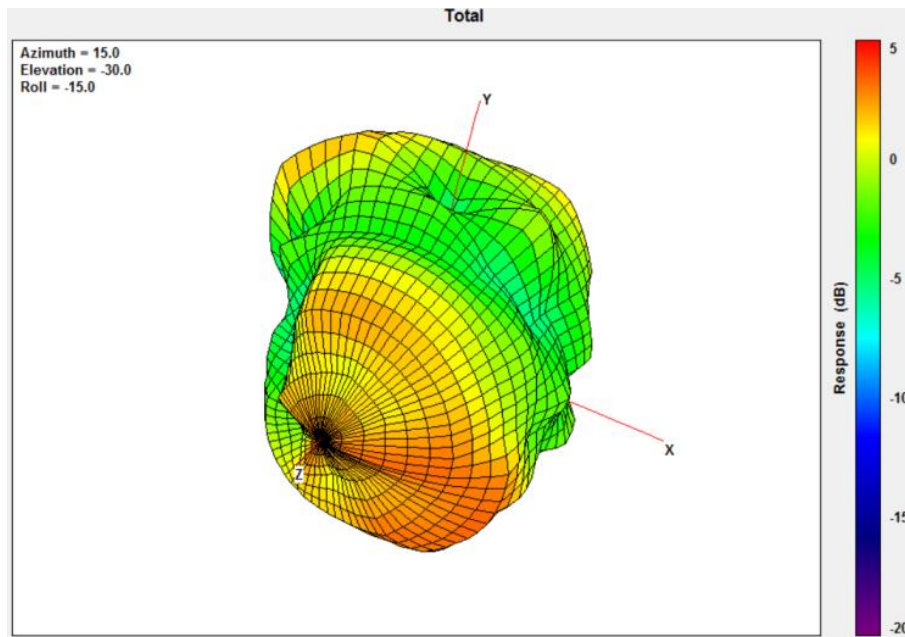
YZ Plane



3.2.6 3D Radiation Patterns Pattern (Wi-Fi_MIMO1 with 3M cable length in free space)



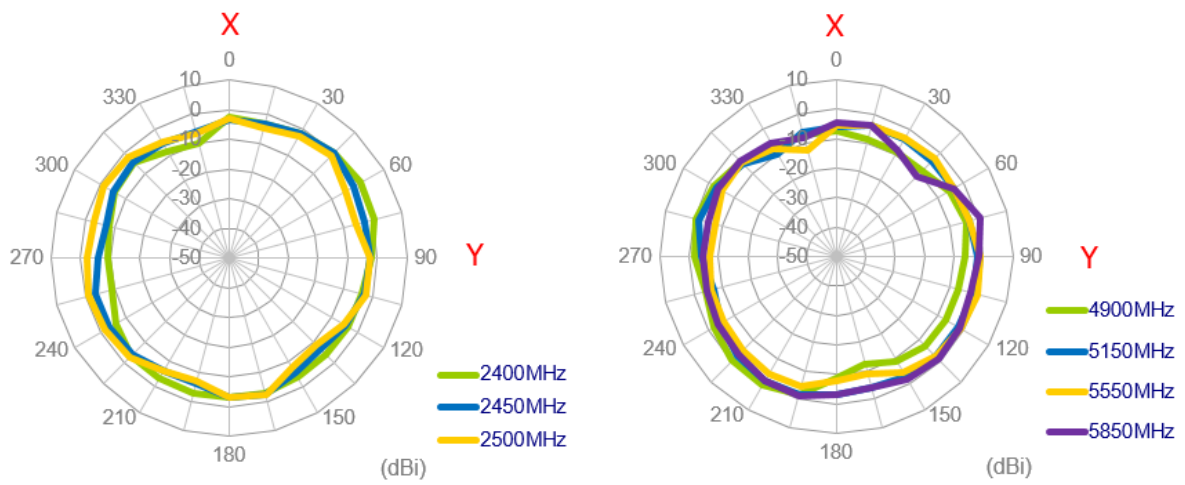
2450MHz



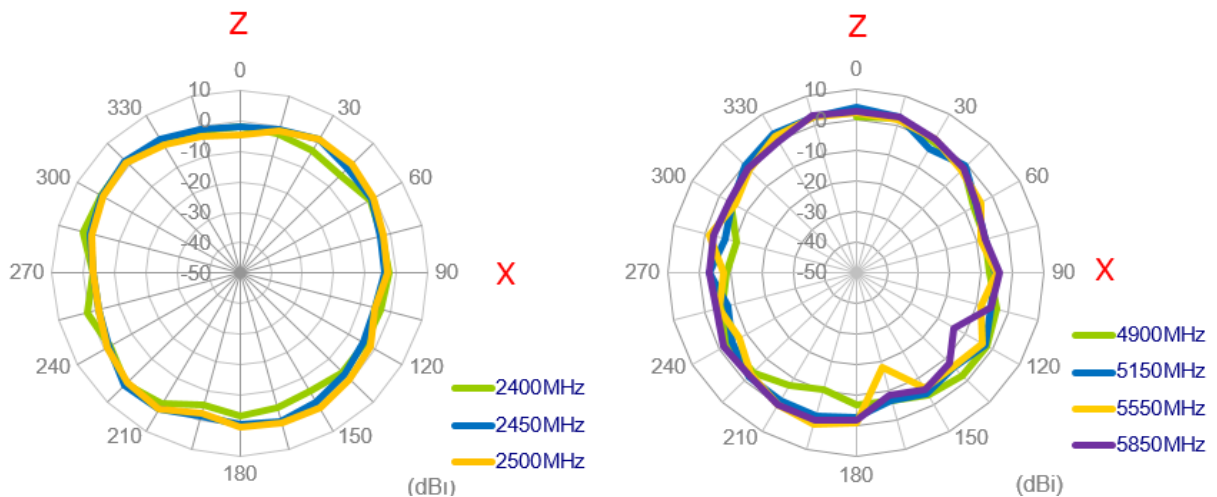
5550MHz

3.2.7 2D Radiation Patterns (Wi-Fi_MIMO2 with 3M cable length in free space)

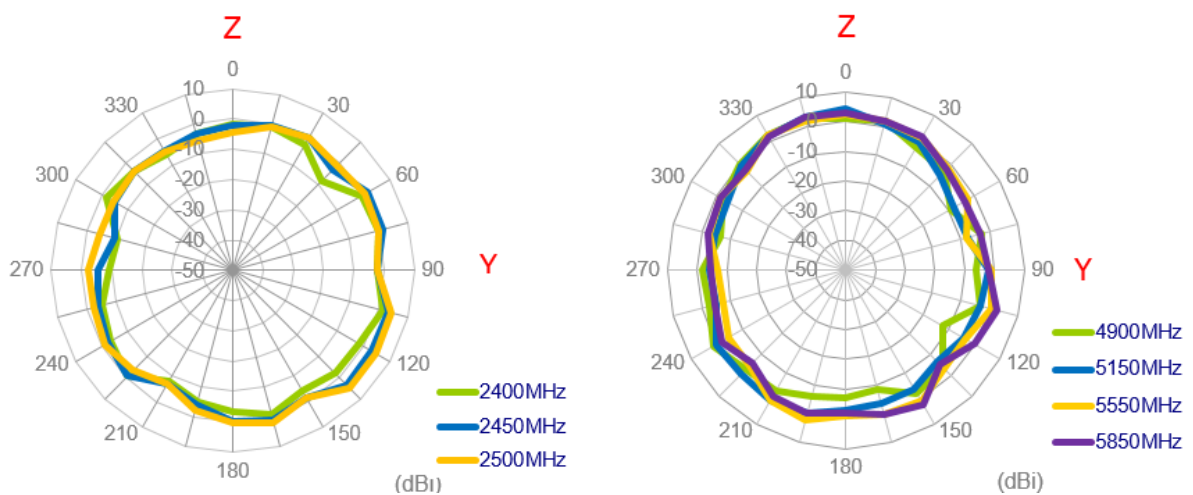
XY Plane



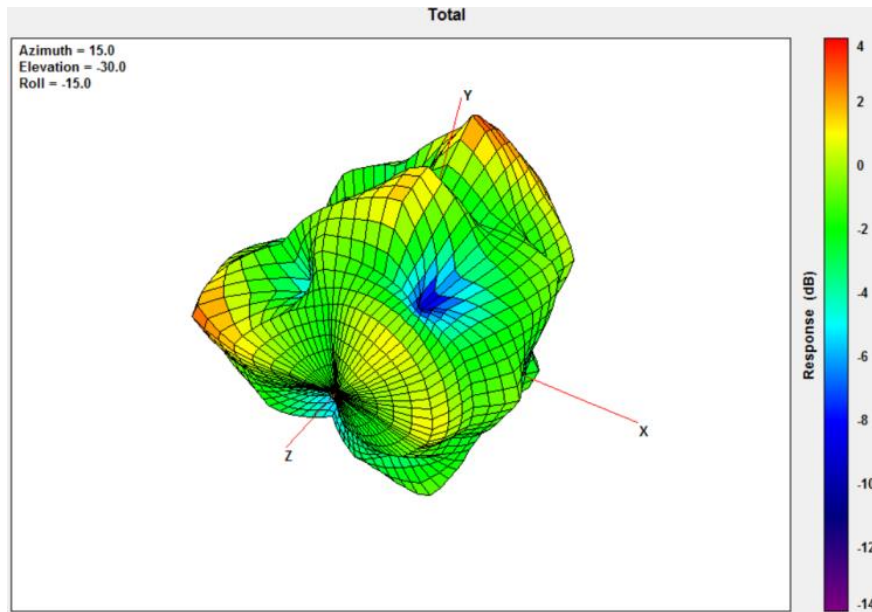
XZ Plane



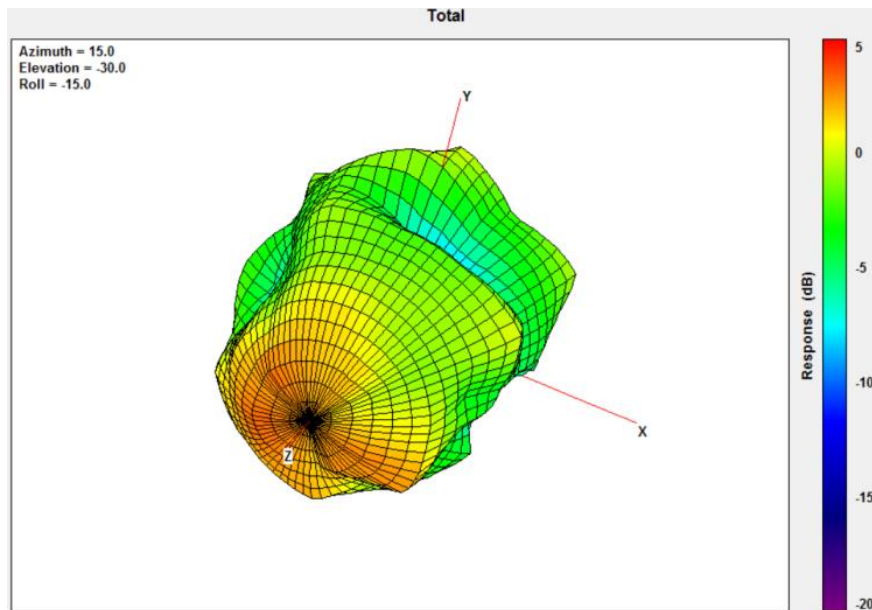
YZ Plane



3.2.8 3D Radiation Patterns Pattern (Wi-Fi_MIMO2 with 3M cable length in free space)



2450MHz



5550MHz

4. Mechanical Drawing (Units: mm)

6	5	4	3	2	1		
ISO NO: EDW-18-8-6262		<Release>					
		REV	ZONE	DESCRIPTION	ENG	APPROVED	ISSUED DATE
		△	ALL	Initial Design	Haley	Paul	2017/08/11
		△	ALL	Cancel Double Sided Adhesive.	Bonnie	Paul	2017/08/22
		△	ALL	Change Label to Heat Shrink Tube with Printing Text. Amend QTY of Screw TP4x25L & Wall mount stud 6x24L.	Bonnie	Paul	2017/11/16
		△	ALL	Separate the bracket.	Bonnie	Sky	2018/02/02
		△	ALL	Modify the Cable to TGC-200<EG-21-08-004>	Aron Yan	Aaron	2022/08/08

Front View

Side View

Back View

Bottom View

Notes:

- All material must be RoHS compliant.
- Color Codes: PANTONE Black / Plastics Color Q728-1-1.
- Finish: Mirror Polish / SPI A-2.
- Deburring: Less than 0.02mm.
- No gate, parting line and any other tooling marks on appearance of product.
- Once product have any crack/break/thread damage or any structural tooling issue, molding supplier need to correct the issue unconditionally.
- Use this drawing together with the corresponding 3D CAD database file to fully describe the part.
- The connector orientation has a fixed position to the antenna as per drawing.
- Double Sided Adhesive Area :
- Part No.: MA961.A.B30PP111.J30PP111.C30PP151.G30PP151.wm
- ** Critical Dimensions.

Name	P/N	Material	Finish	QTY
1 Top Housing	000116B000000A	ASA823S	Black	1
2 Bottom Housing	000116B010000A	ASA823S	Black	1
3 Rubber-2 Holes	000715H010000A	Silicone Rubber	Black	2
4 Clear Label	001015H040000A	PET	Transparent	1
5 Heat Shrink Tube(LTE-1)	001317C020000A	PE	Red Tube/White Text	1
6 Heat Shrink Tube(LTE-2)	001317C030000A	PE	Red Tube/White Text	1
7 Heat Shrink Tube(Wi-Fi-1)	001316L060000A	PE	Yellow Tube/Black Text	1
8 Heat Shrink Tube(Wi-Fi-2)	001316L070000A	PE	Yellow Tube/Black Text	1
9 Hook_Key	000117D020000A	ASA823S	Black	1
10 Empty Label(48*30)	001015G000000A	PEPA	White	1
11 Barcode Label(25*9)	001015G010000A	PET	White	1
12 M09 Series Bracket	000117E060000A	ASA823S	Black	1
13 Screw TP1(3x8L)	000416J000000A	Steel	Ni Plated	3
14 Fastening Washer	000116I000000A	ASA823S	Black	3
15 Screw TP4x25L	000411A040054A	Steel	Ni Plated	2
16 Wall mount stud 6x24L	000411A050054A	Nylon	White	2

Name	P/N	SPEC	Finish	QTY
XX TGC-200 Cable	305416B000000A	KSR200-P	Black	4
YY Connector Type	200220C00001GA	SMA(M)ST	Au Plated	2
ZZ Connector Type	200220K00001GA	RP-SMA(M)ST	Au Plated	2

UNLESS OTHERWISE SPECIFIED TOLERANCES ON:		DATE: 2017/08/11	MAT'L:	 <small>TW Design Centre This drawing and its inherent design concepts are property of Taoglas. Not to be copied or given to third parties without the written consent of Taoglas.</small>	REV D05
.X± 0.2		UNIT: mm	FINISH:		
XX± 0.5 .XX± 0.1		THIRD ANGLE PROJECTION	SCALE: 1/4		
X± 0.3 .XXX± 0.05		APPROVED BY: Paul	CHECKED BY: Jack		
		DRAWN BY: Haley	CUSTOMERS SIGNATURE / DATE		

6	5	4	3	2	1
TITTLE: :4in1 Adhesive 3000mm: LTE(1&2) TGC-200 SMA(M); Wi-Fi(1&2) TGC-200 RP-SMA(M) Wall Mount			PART NO. : MA961.A.BICG.002.wm		

5. Installation Instructions

Introduction

Following these guidelines will help ensure that your Taoglas Guardian antenna is installed correctly. The Guardian is simply mounted via a wall mount bracket, details outlined below.



Electrical Safety

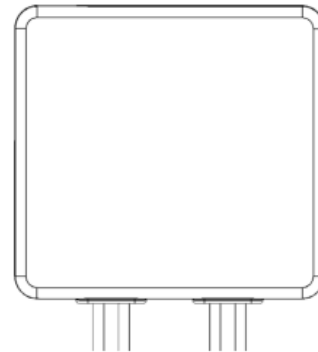
The Pantheon contain an active GPS/GNSS antenna.
Rated voltage: 3-5VDC Rated current: 20mA maximum

The supply to this device must be provided with overcurrent protection of 1A maximum.

Power consumption@1.8V (mA) 8.7 mA

Power consumption@3.0V (mA) 9.0 mA

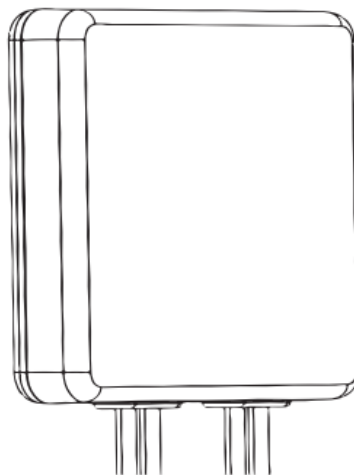
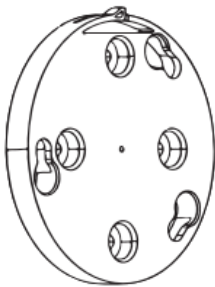
Power consumption@5.5V (mA) 11 mA



Installation Requirements

Antenna Components:

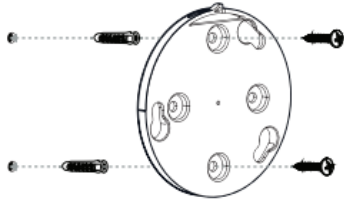
- Antenna Enclosure x 1
- Mounting Bracket x1
- Screws x2
- Rawl Plugs x2



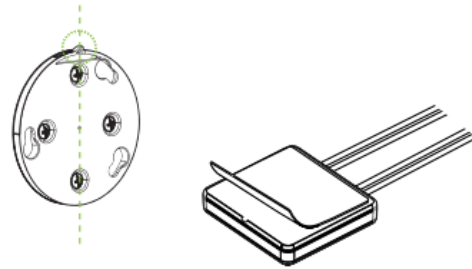
Tools Required:

Screwdriver, drill, M4 [Gauge 8]

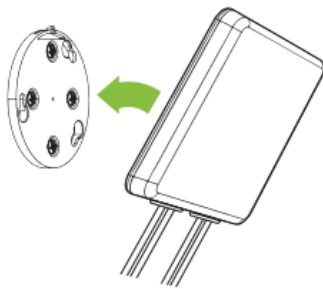
Wall Mount



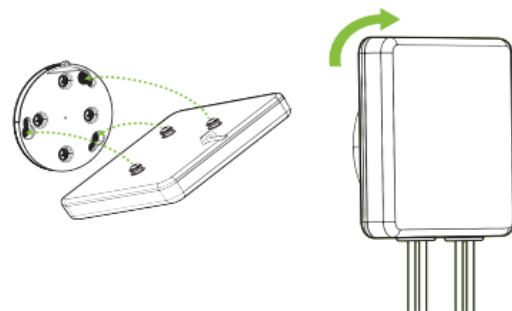
1. Using the mounting bracket as guide, mark the position of the wall screws to the desired location of the bracket. Drill holes for the wall mount studs (6mm [1/4"] diameter, min. 25mm [1"] depth) and secure the studs in place. Insert screws through the bracket holes and into the wall studs. Tighten the screw to secure the mounting bracket to the wall.



2. Connect the the back of the antenna to the brakcet via the 3 built-in mounting points on the rear of the antenna.
Note: The locking mechanism is highlighted in green.



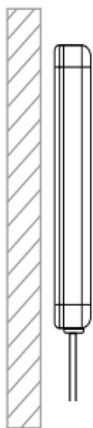
3. Press the antenna into the open area of the holes on the bracket via the mounting points.
Note: The antenna and bracket should be mounted level on the horizontal plane.



4. Rotate the Antenna in to the bracket by turning slightly. The locking mechanism on the bracket and back of the antenna should be connected together at the point.

5. Completed Installation of the .

Note: The bracket should be flush with antenna.



Notices



Caution

To comply with FCC RF Exposure requirements in section 1.1310 of the FCC Rules, antennas used with this device must be installed to provide a separation distance of at least 20 cm from all persons to satisfy RF exposure compliance.



Warning

Do not Operate the transmitter when someone is within 20 cm of the antenna.
Do not operate the equipment in an explosive atmosphere.



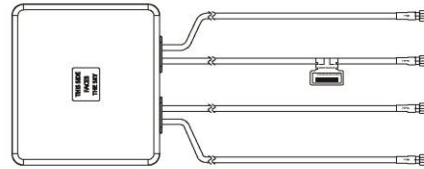
European Waste Electronic Equipment Directive 2002/96/EC

Please ensure that your old Waste Electricals and Electronics are recycled do not throw them away into standard waste.

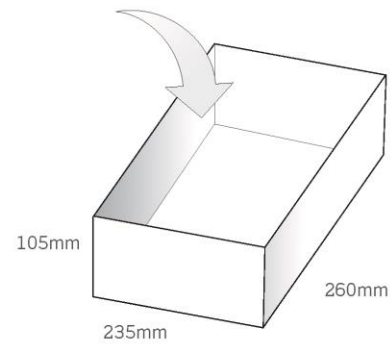
Waiver: This document represents information compiled by Taoglas to the best of our current knowledge. This is not intended to be used as a representation or warranty of fitness of the products described for any particular purpose. This document details guidelines for general information purposes only. When planning installations, always seek specialist advice and ensure that the products are always installed by a properly qualified installer in accordance with applicable regional laws and regulations.

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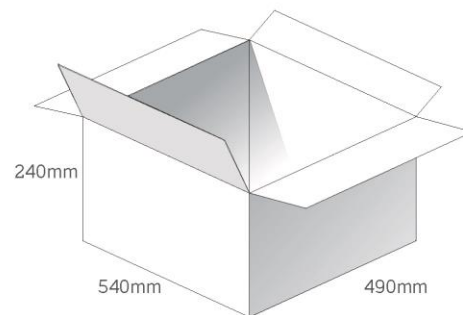
6. Packaging



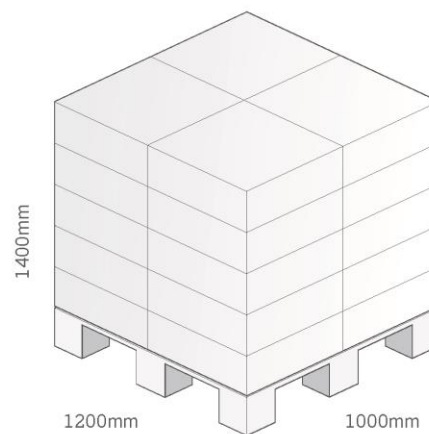
1 MA961.W.A.BICG.002.wm per small box
 Box Dimensions - 260 x 235 x 105mm
 Weight - 1000g



1 Outer Carton
 Carton Dimensions - 540 x 490 x 240mm
 8 pcs MA961.W.A.BICG.002.wm per carton
 Weight - 9.01Kg



Pallet Dimensions 1200*1000*1400mm
 20 Cartons per Pallet
 4 Cartons per layer
 5 Layers



Changelog for the datasheet

SPE-18-8-021 – MA961.W.A.BICG.002.wm

Revision: C (Current Versions)

Date:	2023-07-12
Notes:	Updated Installation Instructions
Author:	Cesar Sousa

Previous Revisions

Revision: B

Date:	2022-07-07
Notes:	Updated Drawing and specifications
Author:	Cesar Sousa

Revision: A (Original First Release)

Date:	2018-01-19
Notes:	Initial Datasheet Release
Author:	Author



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