TAOGLAS



Datasheet

Steedan

Part No:
MA351.A.BI.001

Description:

Steedan 2-in-1 Magnetic Mount Combination Antenna with 2*5G/4G MIMO

Features:

Low Profile Magnetic Mount Enclosure
2* 5G/4G MIMO 600-6000MHz
IP65 Rated, Ruggedized PC/ABS Enclosure
LTE: 3m TGC200 Cable and SMA(M)ST Connector
Dimensions: 250 x 144.3 x 52.8mm
RoHS & Reach Compliant

1.	Introduction	3
2.	Specifications	4
3.	Antenna Characteristics	7
4.	Radiation Patterns	12
5.	Mechanical Drawing	33
6.	Packaging	34
7.	Application Note	35
	Changelog	44

Taoglas makes no warranties based on the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions at any time without notice. Taoglas reserves all rights to this document and the information contained herein. Reproduction, use or disclosure to third parties without express permission is strictly prohibited.

Ireland ISO 9001: 2015 Certified
ISO 9001 CERTIFICATION EUROPE
Taiwan ISO 9001: 2015 Certified
RNATIONAL
UKAS QUALITY MANAGEMENT 046
QUALITY MANAGEMENT SYSTEM IATF16949

1. Introduction



The Taoglas Steedan MA351 is a 2-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 52.8mm high it mounts discretely to the target application out of sight of most onlookers.

This outstanding antenna delivers powerful MIMO antenna technology 5G/4G. The 3 internal antennas have superior isolation. The 5G/4G 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
- First Net Responder Routers

The MA351 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 MA351 can also be customized for your particular wireless application and frequency band, subject to NRE and MOQ. There are 2x 3000mm low loss TGC-200 cables, terminating in SMA(M) connectors for 5G/4G MIMO. There is a 3000mm RG-174 cable for GNSS terminating in an SMA(M) connector. All cable lengths and connector types are customizable, for further information contact your regional Taoglas customer support team.

2. Specifications

5G/4G MIMO Free Space Electrical									
Band	**Frequency (MHz)**		**Efficiency (%)**	**Average Gain (dB)**	**Peak Gain (dBi)**	**Impedance**	**Max Input Power**	**Polarization**	**Radiation Pattern**
5GNR/4G Band 71	617~698	MIMO 1	34.1	-4.7	1.1	50 Ω	10W	Linear	Omni-Directional
		MIMO 2	21.6	-6.7	0.1				
4G/3G Band 12,13,14,17,28,29	698~824	MIMO 1	32.8	-4.8	3				
		MIMO 2	47.1	-3.3	3.5				
4G/3G/NB-IoT/Cat M Band 5,8,18,19,20,26,27	824~960	MIMO 1	39.7	-4	4.2				
		MIMO 2	53.2	-2.7	4				
5GNR/4G Band 21,32,74,75,76	1427~1518	MIMO 1	43.2	-3.7	3.1				
		MIMO 2	54.1	-2.7	3.6				
4G/3G Band 1,2,3,4,9,23,25,35,39,66	1710~2200	MIMO 1	46.8	-3.3	5.5				
		MIMO 2	38.5	-4.1	5				
4G/3G Band 7,38,40,41	2300~2690	MIMO 1	41.7	-3.8	4.9				
		MIMO 2	39.5	-4	5.7				
5G NR Band 22,42,48,77,78,79	3300~5000	MIMO 1	46	-3.4	3.9				
		MIMO 2	46.4	-3.3	4.8				
LTE5200/ Wi-Fi 5800	5150~5925	MIMO 1	23.9	-6.2	1.6				
		MIMO 2	26	-5.8	1.7				

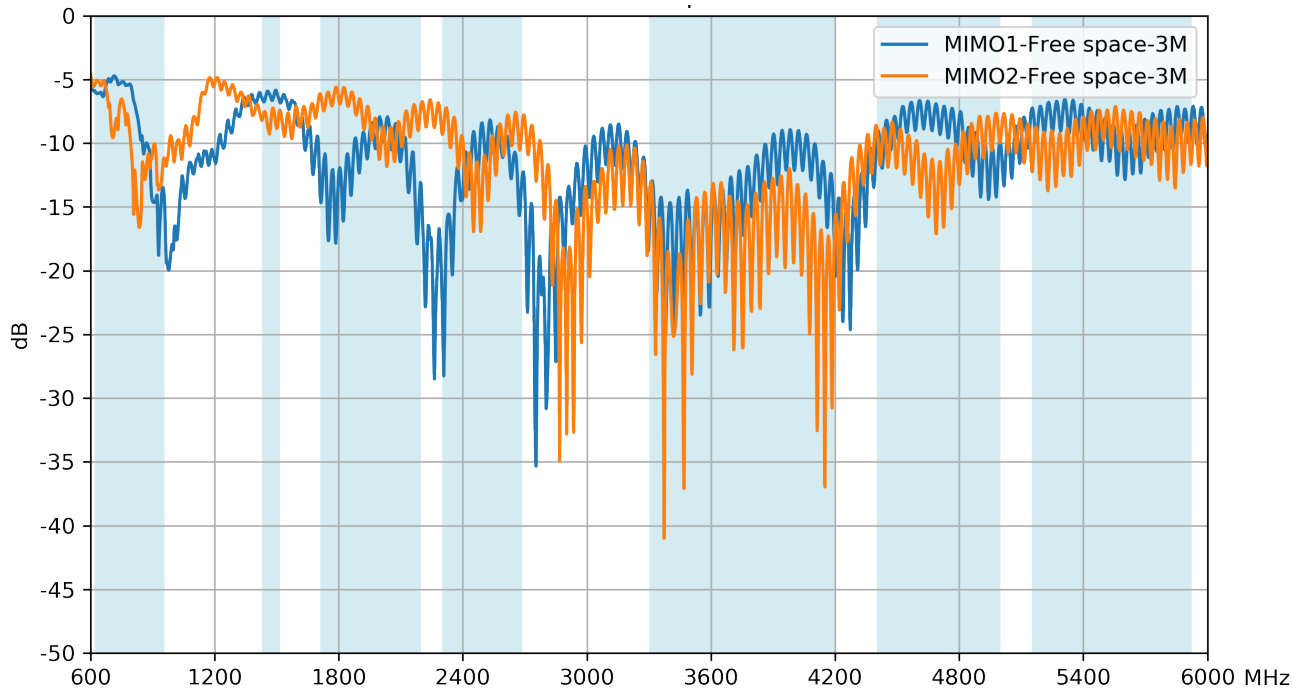
5G/4G MIMO 30*30cm Ground Plane Electrical									
Band	**Frequency (MHz)**		**Efficiency (%)**	**Average Gain (dB)**	**Peak Gain (dBi)**	**Impedance**	**Max Input Power**	**Polarization**	**Radiation Pattern**
5GNR/4G Band 71	617~698	MIMO 1	33.6	-4.7	1.6	50 Ω	10W	Linear	Omni-Directional
		MIMO 2	22.3	-6.5	-1.6				
4G/3G Band 12,13,14,17,28,29	698~824	MIMO 1	35.3	-4.5	2.3				
		MIMO 2	21.5	-6.7	2.1				
4G/3G/NB-IoT/Cat M Band 5,8,18,19,20,26,27	824~960	MIMO 1	44.8	-3.5	5				
		MIMO 2	34.8	-4.6	4				
5GNR/4G Band 21,32,74,75,76	1427~1518	MIMO 1	26.8	-5.7	3.4				
		MIMO 2	40	-4	5.1				
4G/3G Band 1,2,3,4,9,23,25,35,39,66	1710~2200	MIMO 1	41.8	-3.8	6.6				
		MIMO 2	37.9	-4.2	6				
4G/3G Band 7,38,40,41	2300~2690	MIMO 1	37.9	-4.2	5.9				
		MIMO 2	40.5	-3.9	6.9				
5G NR Band 22,42,48,77,78,79	3300~5000	MIMO 1	44.9	-3.5	5.4				
		MIMO 2	48.1	-3.2	5.9				
LTE5200/ Wi-Fi 5800	5150~5925	MIMO 1	21	-6.8	3				
		MIMO 2	23.5	-6.3	3.3				

Mechanical	
Dimensions	250 x 144.3 x 52.8mm
Weight	550 g
Material	PC+ABS
Connector	LTE: SMA(M)
Cable	LTE MIMO: 3000mm TGC200
Sealant	Rubber Stopper
Environmental	
Protection	IP65
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

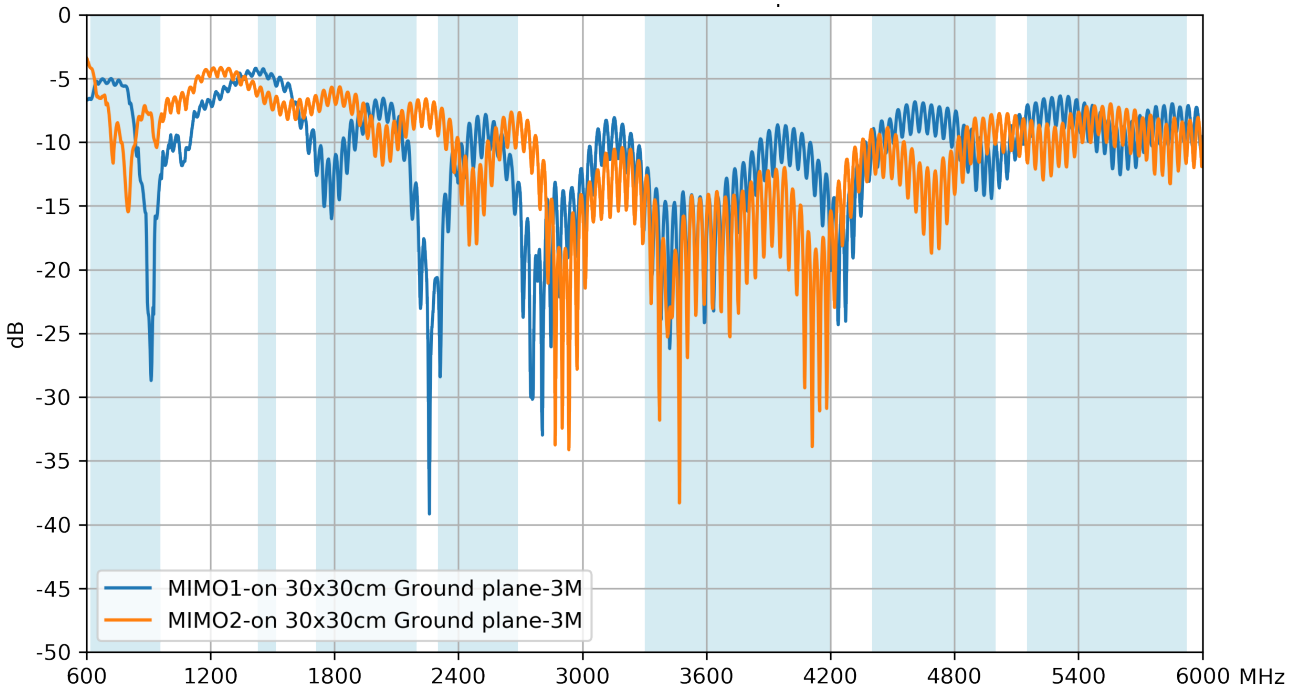
5G/4G Bands			
Band Number	5GNR / FR1 / LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA		
	Uplink	Downlink	Covered
1	UL: 1920 to 1980	DL: 2110 to 2170	✓
2	UL: 1850 to 1910	DL: 1930 to 1990	✓
3	UL: 1710 to 1785	DL: 1805 to 1880	✓
4	UL: 1710 to 1755	DL: 2110 to 2155	✓
5	UL: 824 to 849	DL: 869 to 894	✓
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	✓
18	UL: 815 to 830	DL: 860 to 875	✓
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	✓
24	UL:1625.5 to 1660.5	DL: 1525 to 1559	✓
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	✓
28	UL: 703 to 748	DL: 758 to 803	✓
29	UL: -	DL: 717 to 728	✓
30	UL: 2305 to 2315	DL: 2350 to 2360	✓
31	UL: 452.5 to 457.5	DL: 462.5 to 467.5	✗
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		✓
48	3550 to 3700		✓
66	UL: 1710-1780	DL: 2110-2200	✓
71	617 to 698		✓
74/75/76	1427 to 1518		✓
78	3300 to 3800		✓
79	4400 to 5000		✓
126	410 to 430		✗

3. Antenna Characteristics

3.1 Return Loss – 5G/4G MIMO Free Space

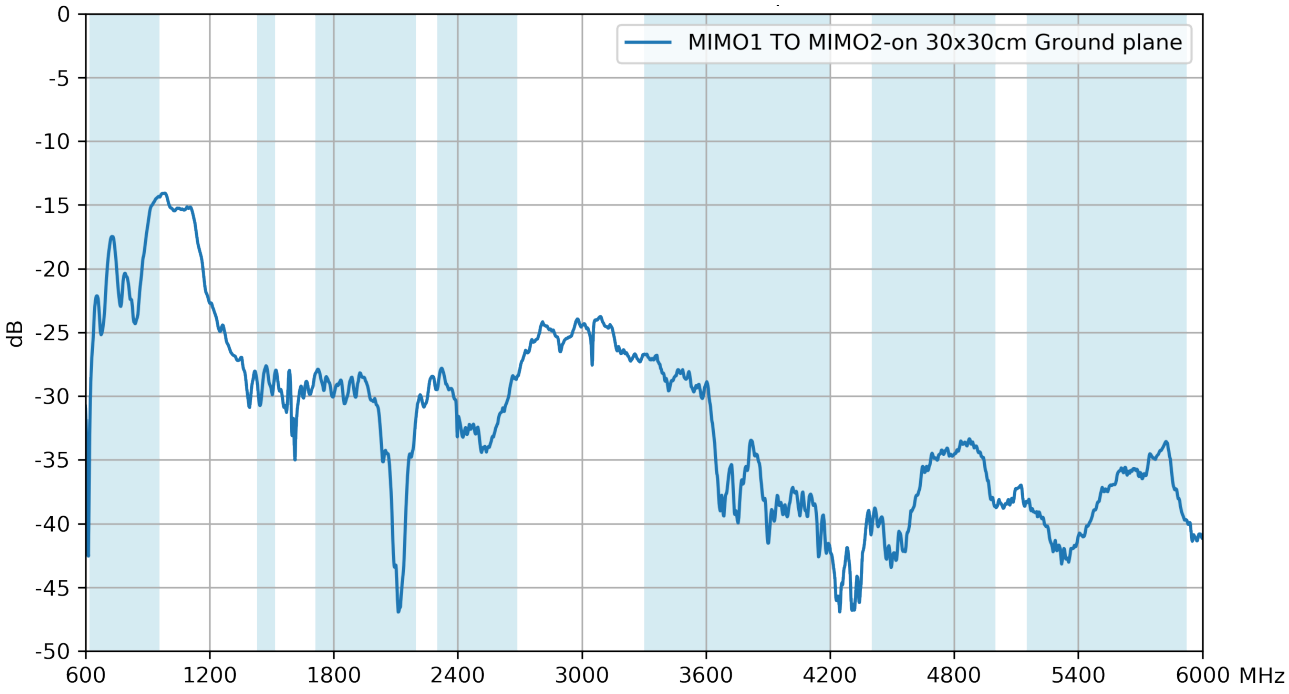


3.2 Return Loss – 5G/4G MIMO 30*30cm Ground Plane

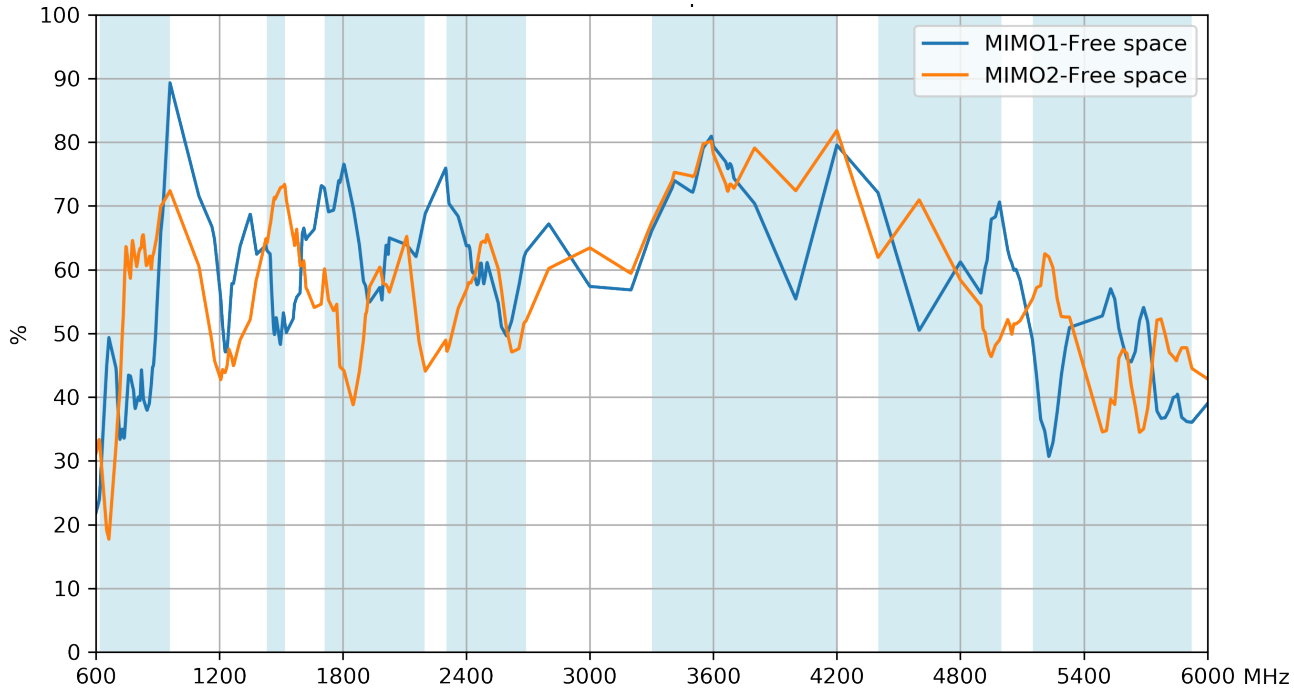


3.3 Isolation

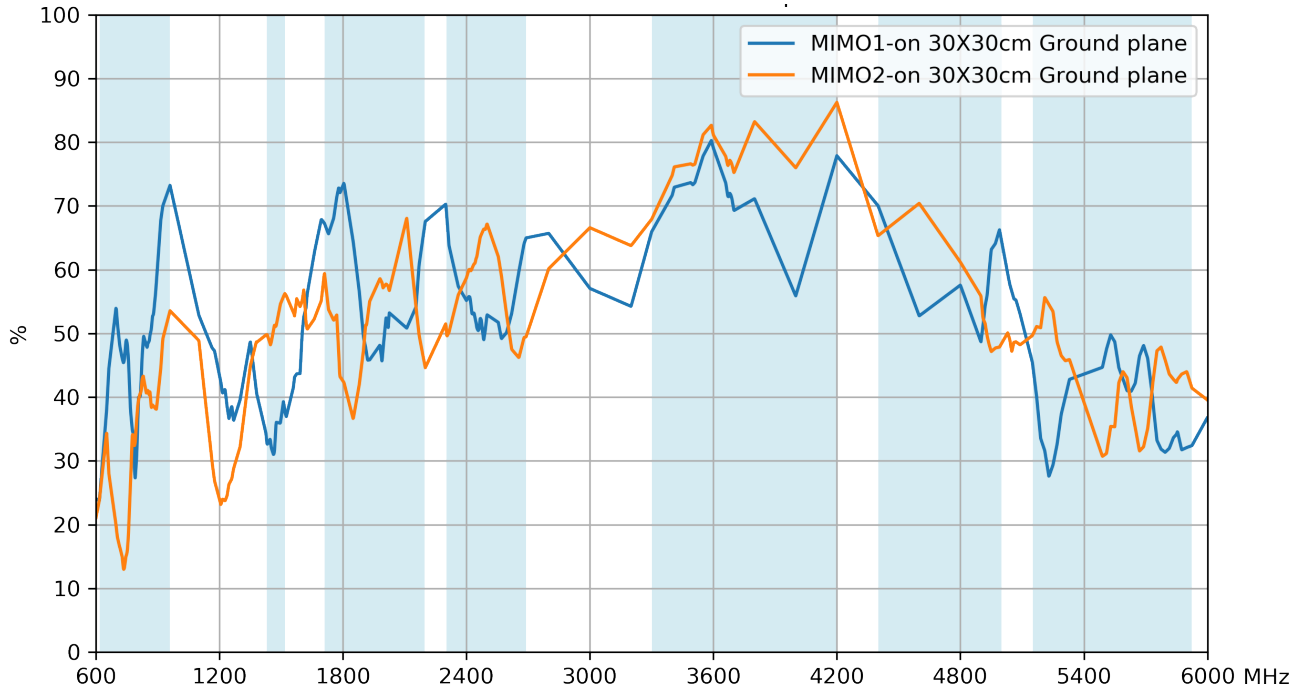




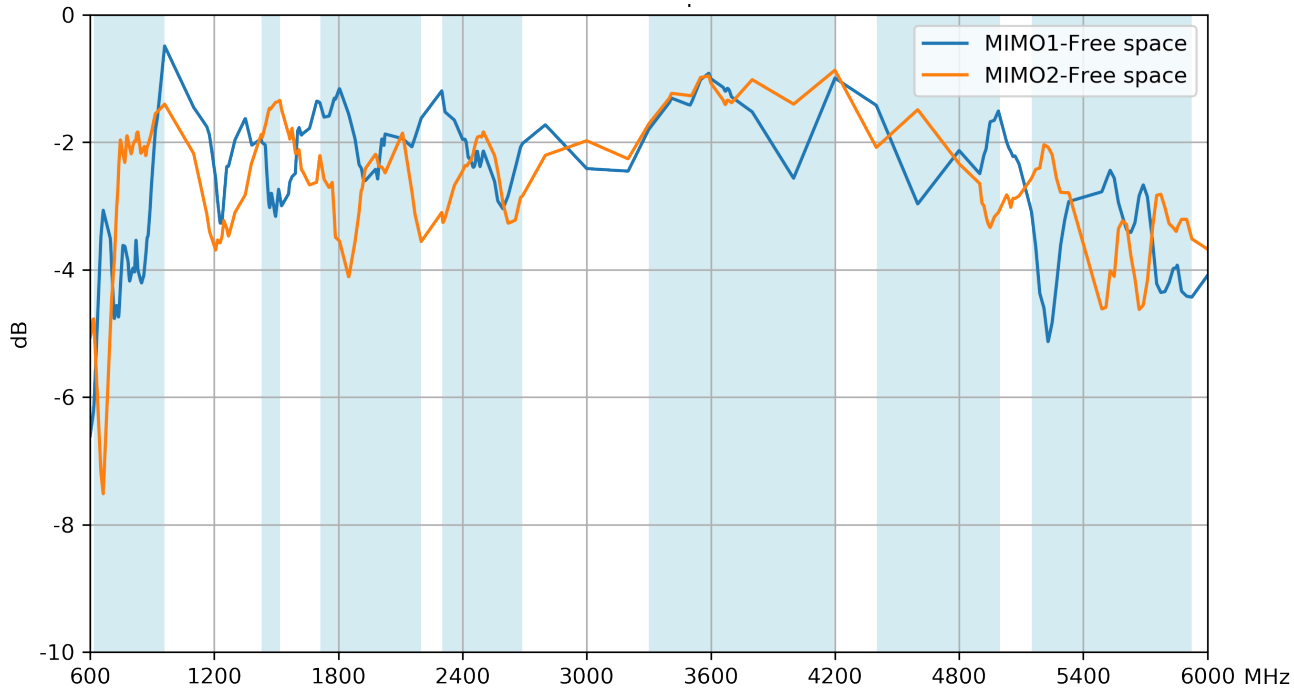
3.4 Efficiency – 5G/4G MIMO Free Space



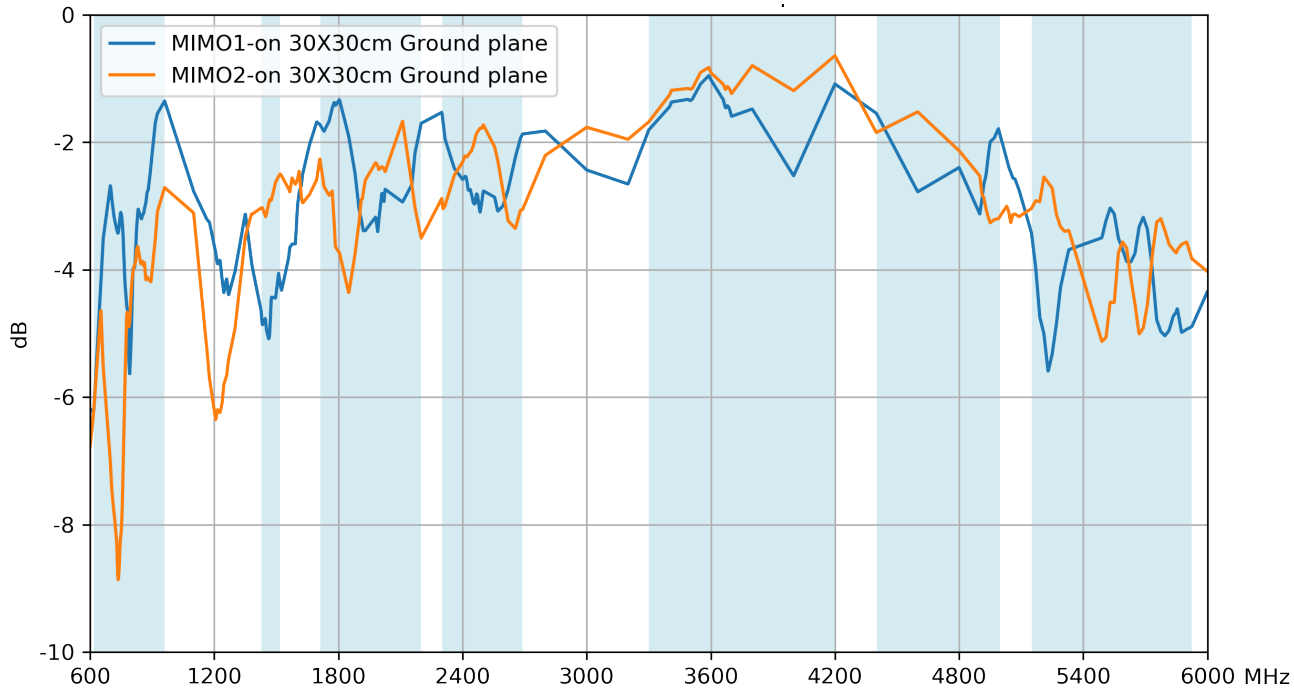
3.5 Efficiency – 5G/4G MIMO 30*30cm Ground Plane



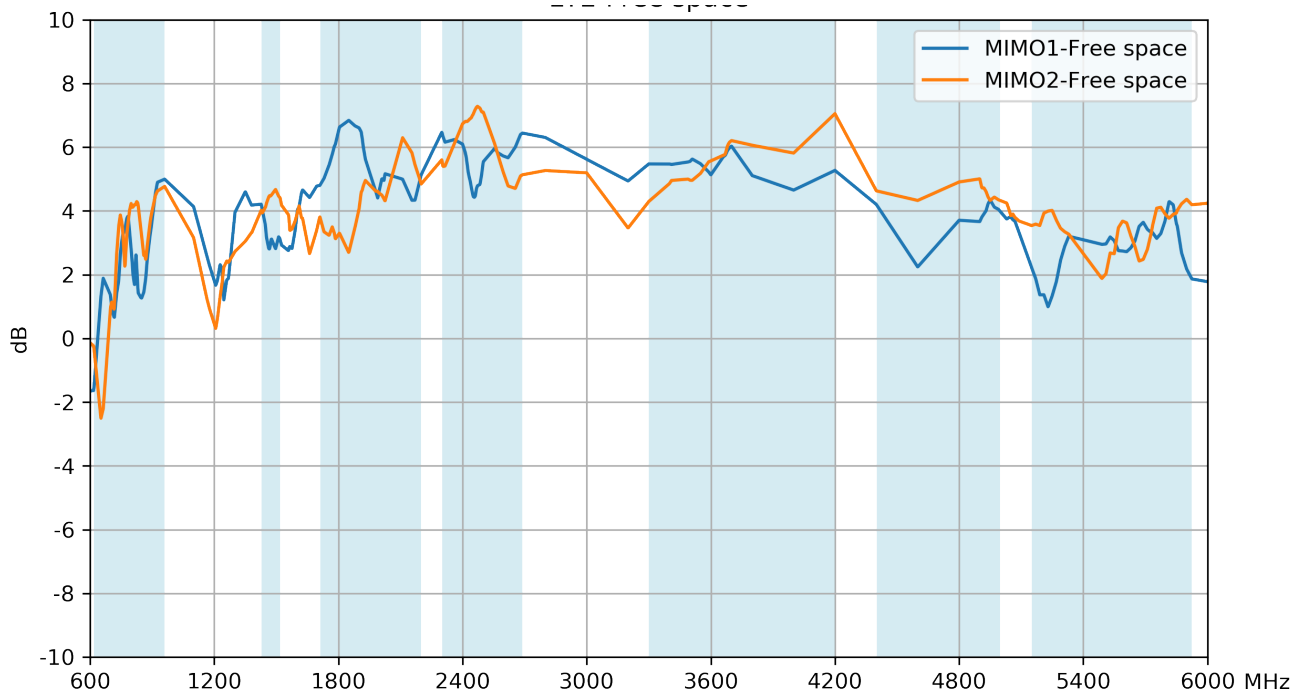
3.6 Average Gain – 5G/4G MIMO Free Space



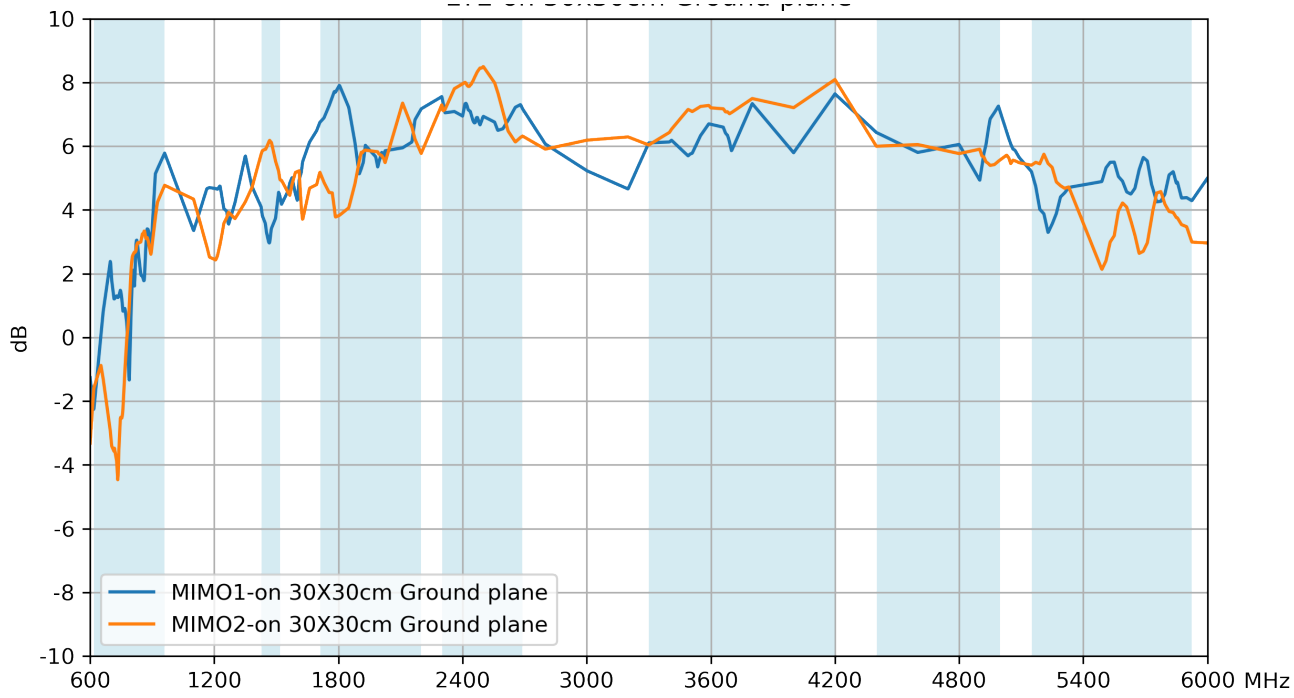
3.7 Average Gain – 5G/4G MIMO 30*30cm Ground Plane



3.8 Peak Gain – 5G/4G MIMO Free Space

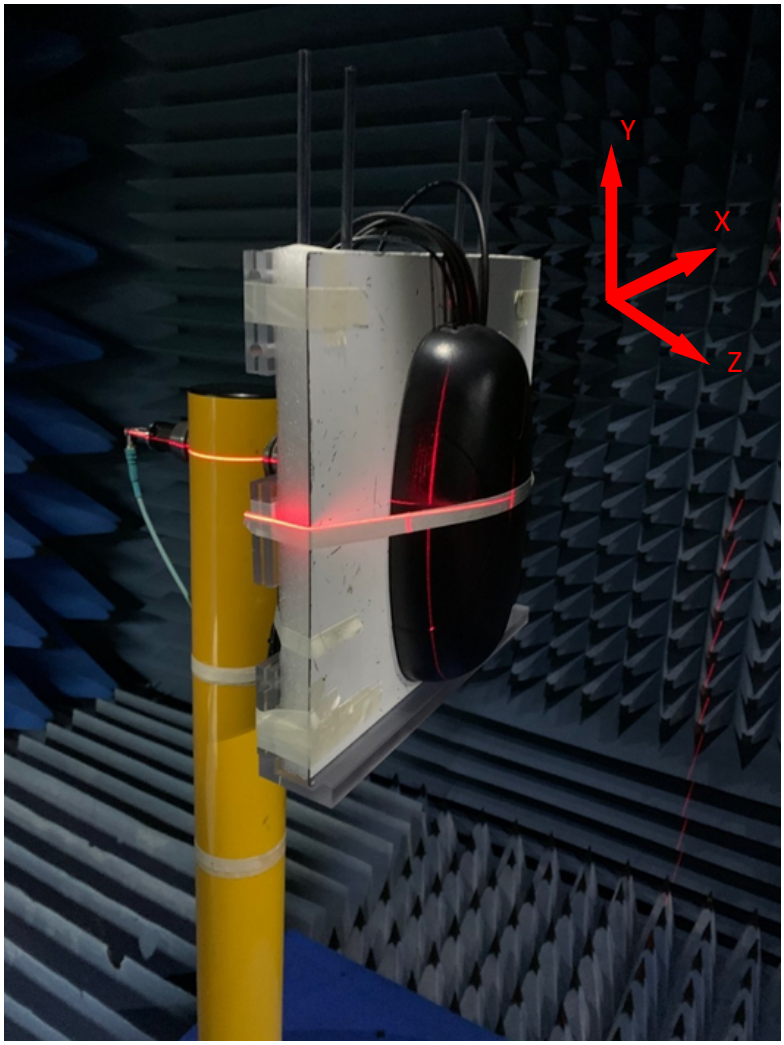


3.9 Peak Gain – 5G/4G MIMO 30*30cm Ground Plane



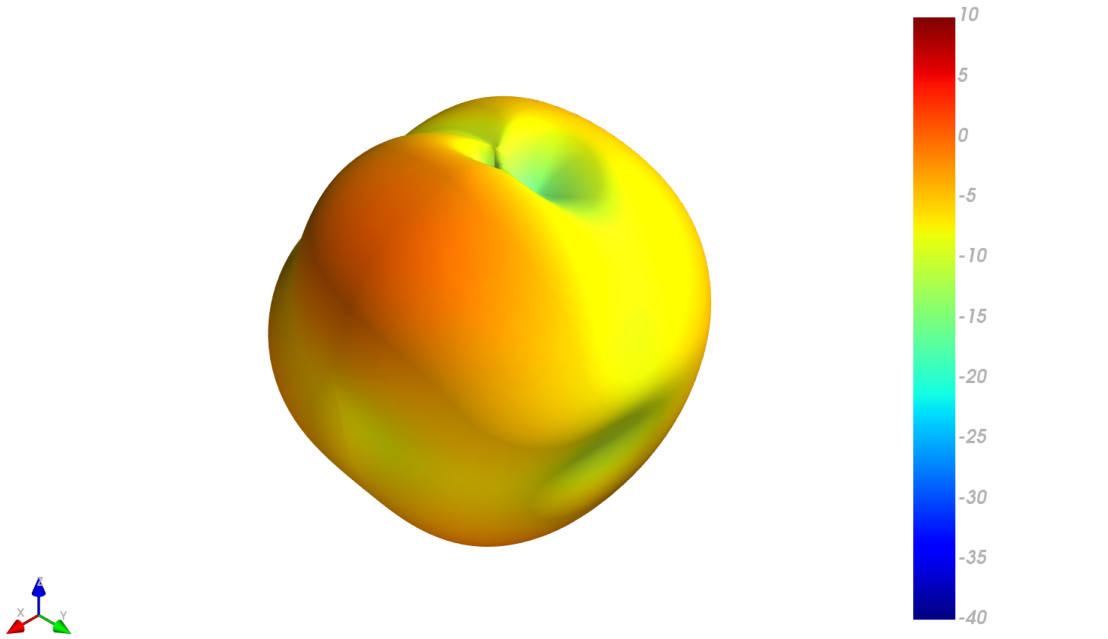
4. Radiation Patterns

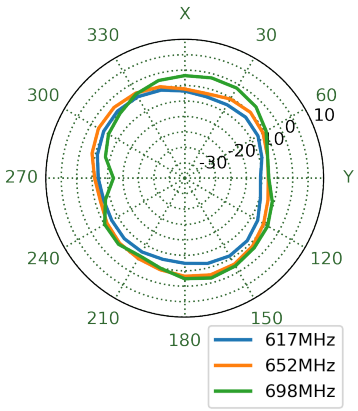
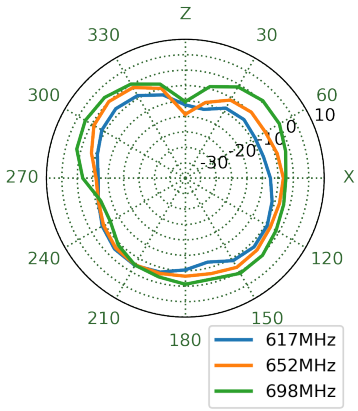
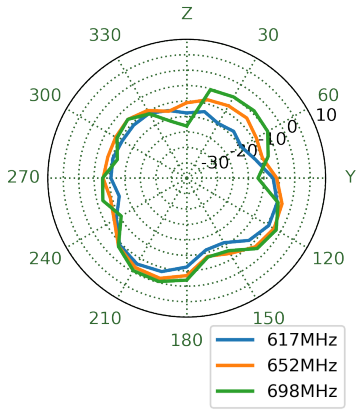
4.1 Test Setup – 30*30cm Ground Plane



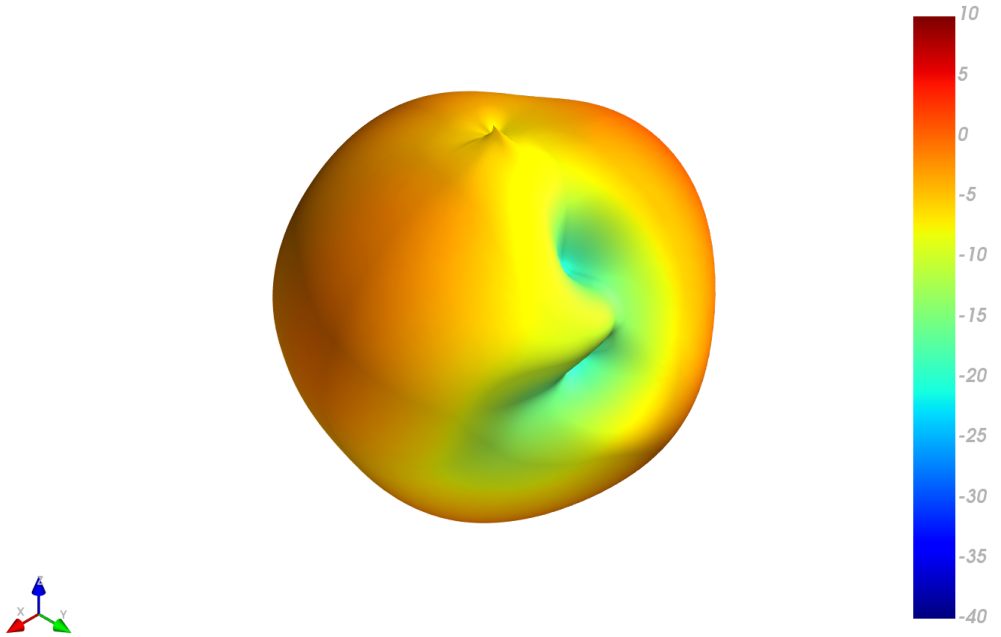
4.2 5G/4G MIMO 1 3D and 2D Radiation Patterns – 30*30cm Ground Plane

652MHz

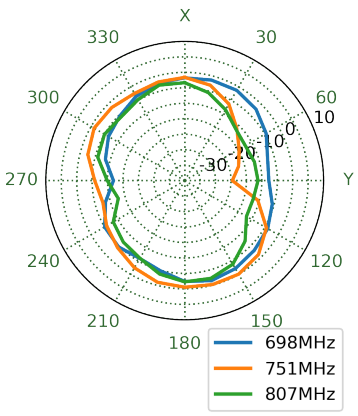


XY Plane	XZ Plane	YZ Plane
		

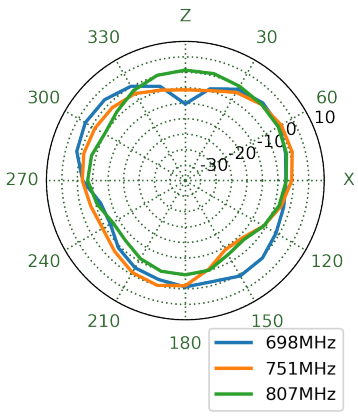
751MHz



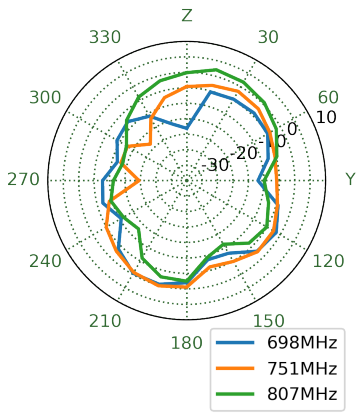
XY Plane



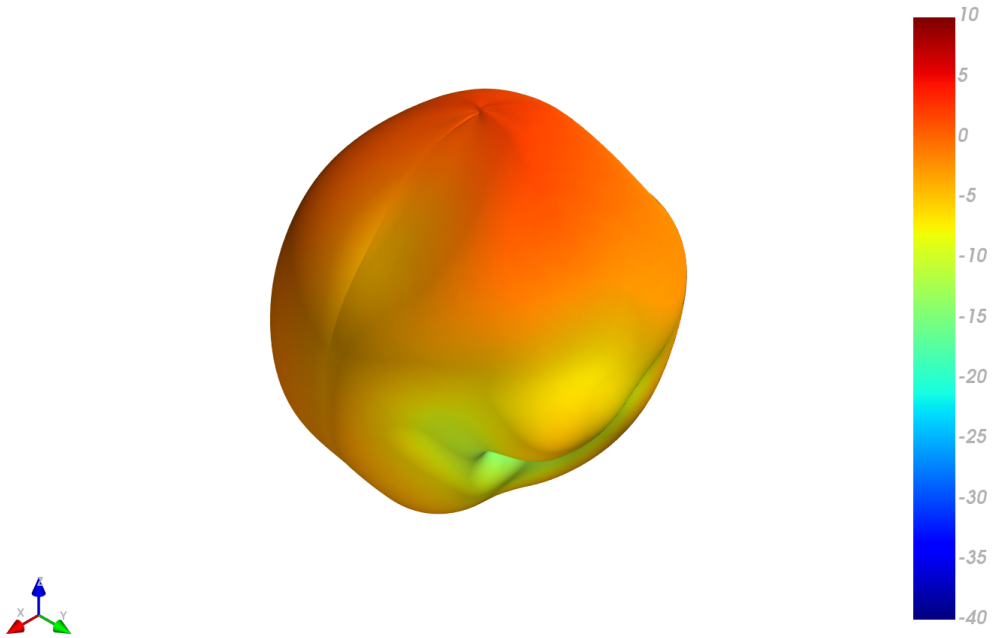
XZ Plane

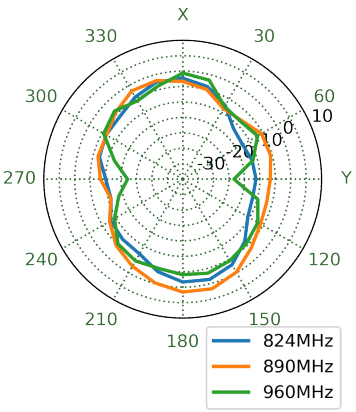
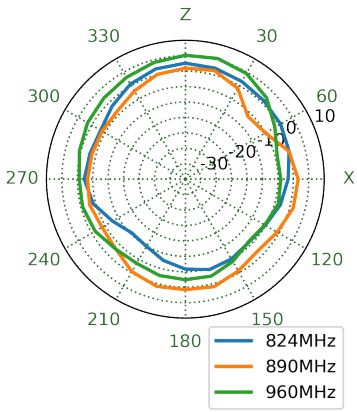
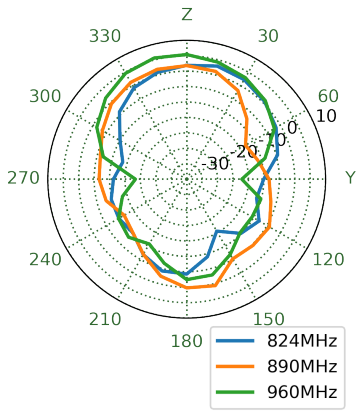


YZ Plane

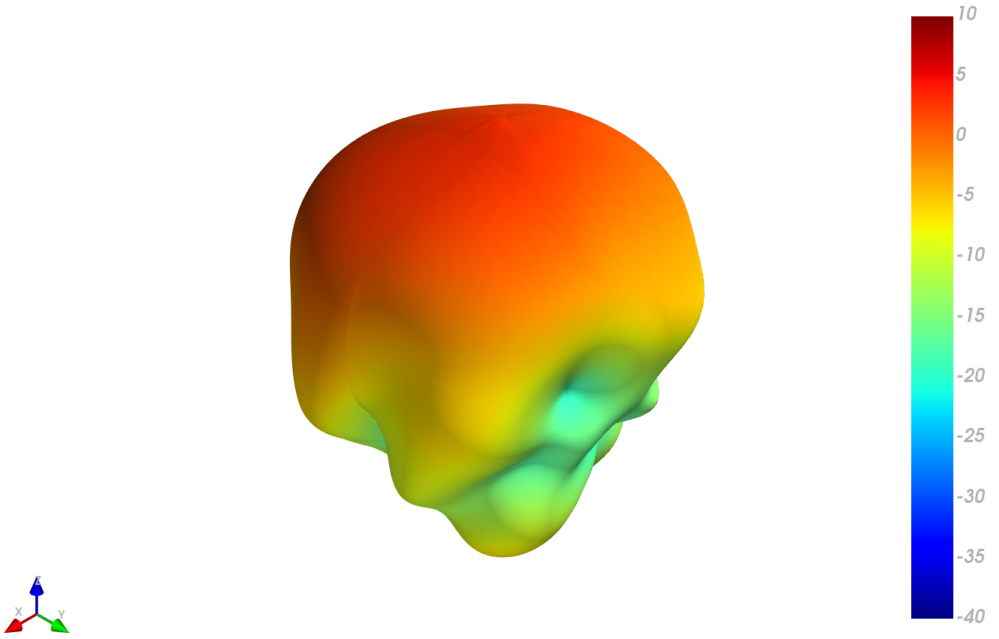


890MHz

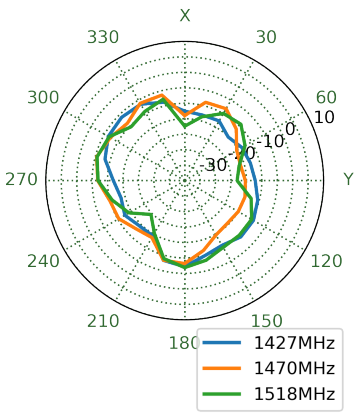


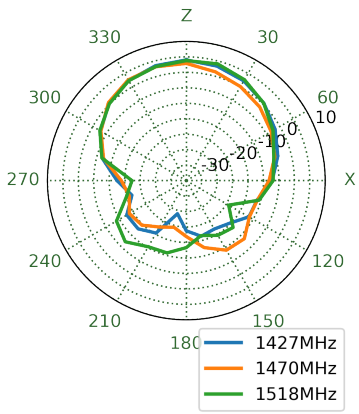
XY Plane	XZ Plane	YZ Plane
		

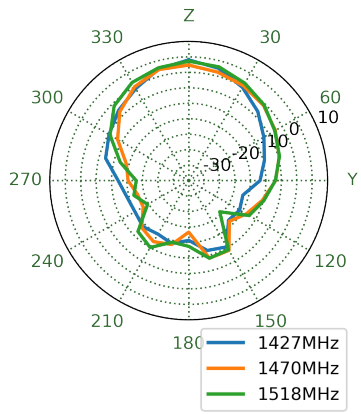
1470MHz



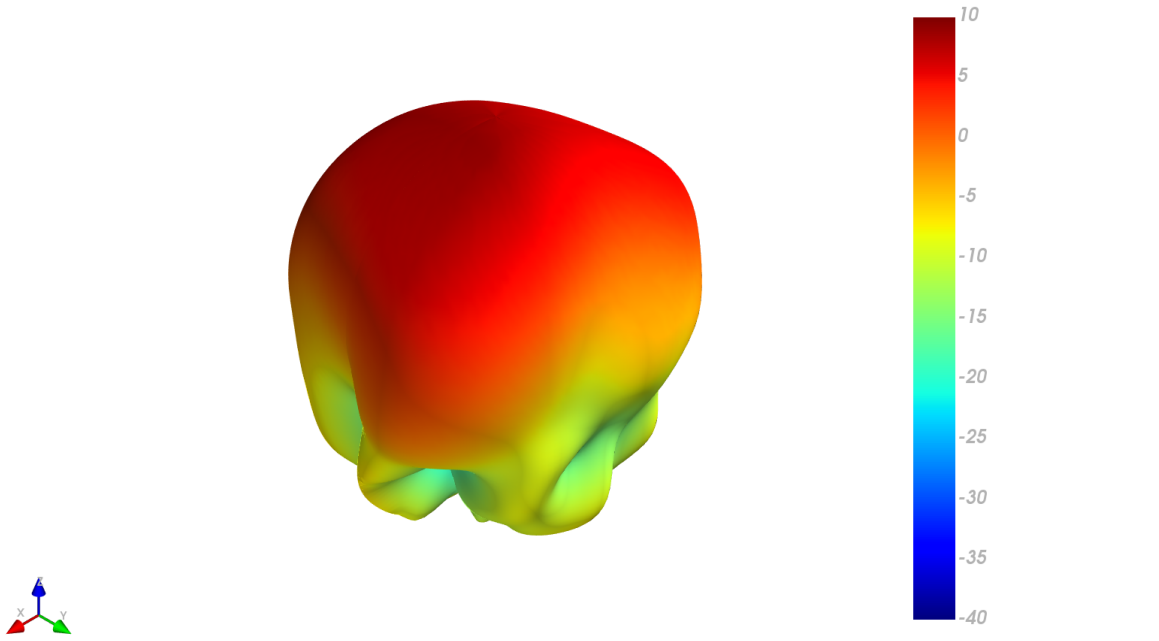
XY Plane	XZ Plane	YZ Plane

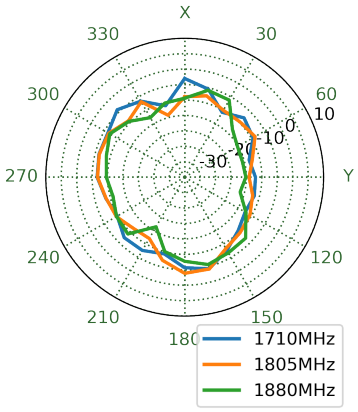
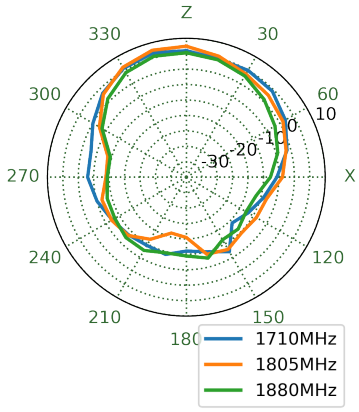
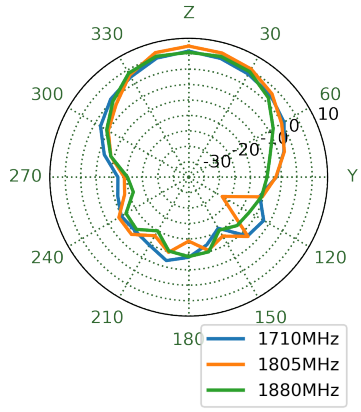




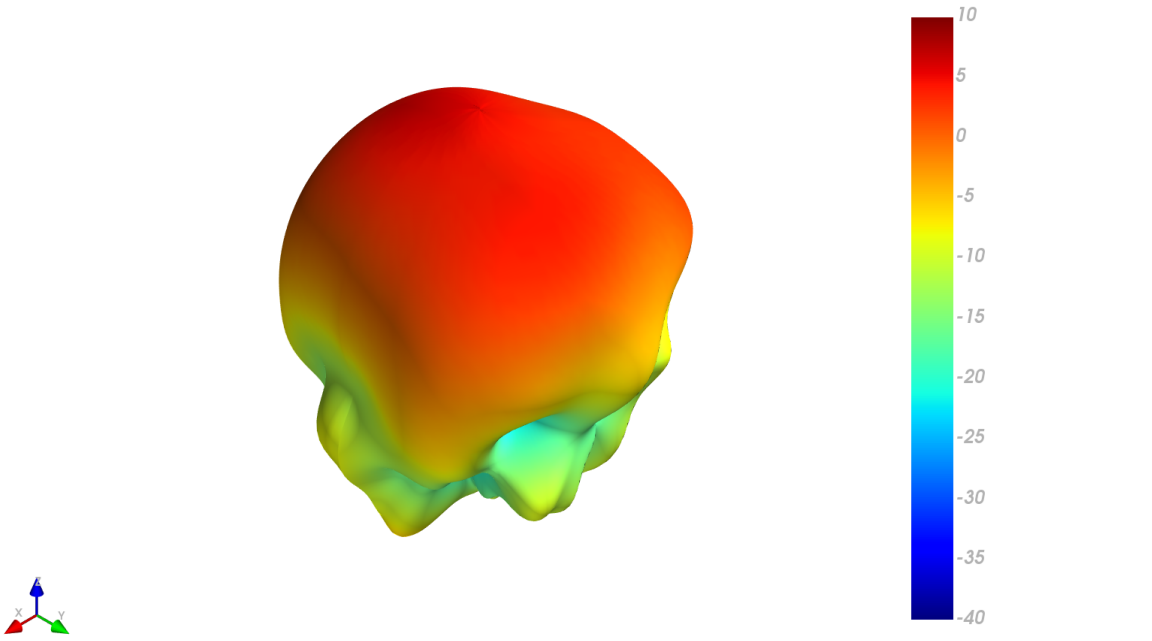


1805MHz

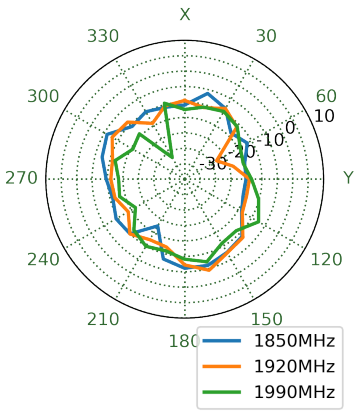


XY Plane	XZ Plane	YZ Plane
		

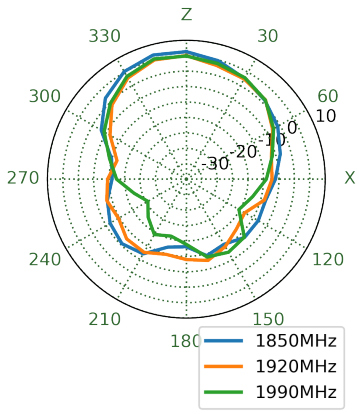
1920MHz



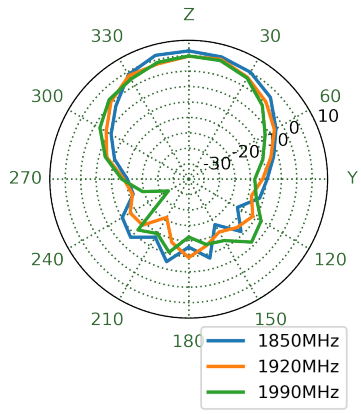
XY Plane



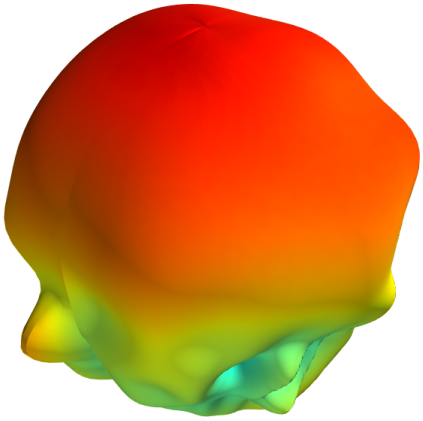
XZ Plane



YZ Plane



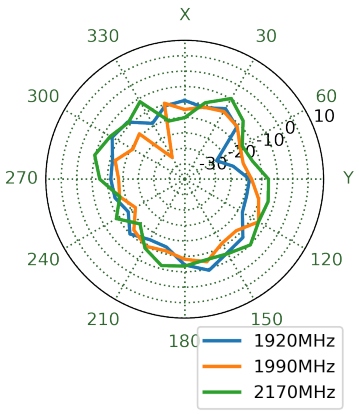
1990MHz



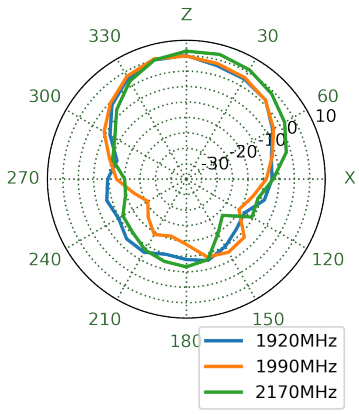




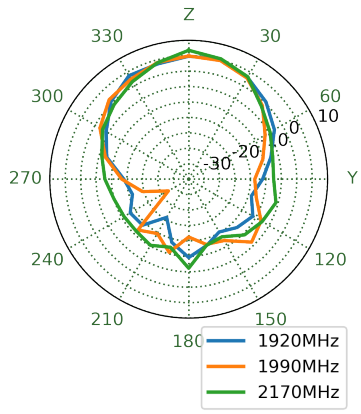
XY Plane



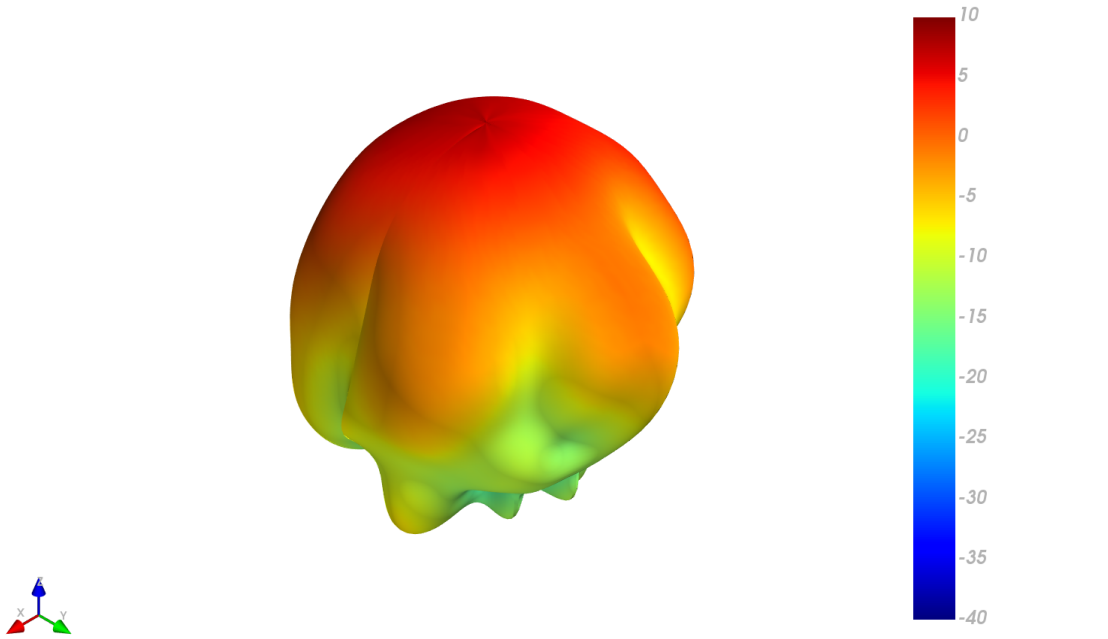
XZ Plane



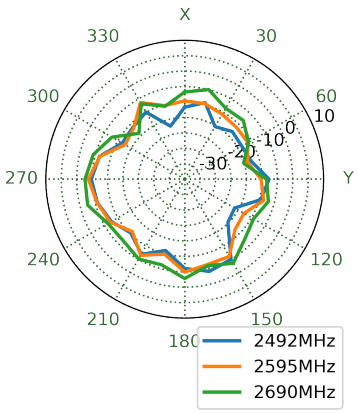
YZ Plane



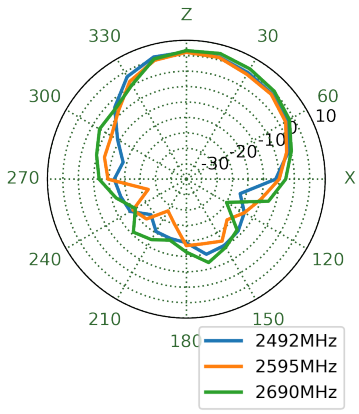
2595MHz



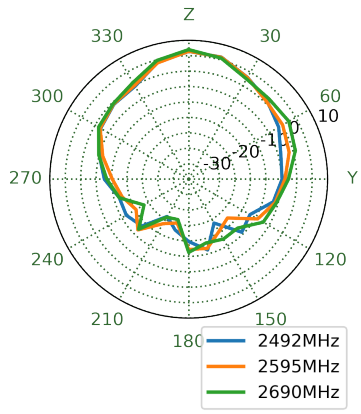
XY Plane



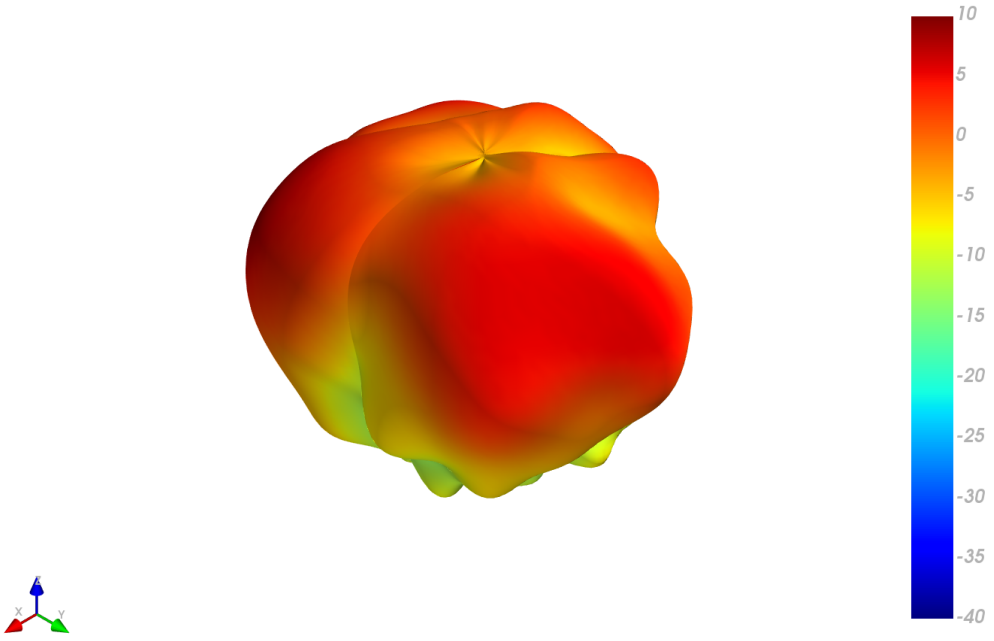
XZ Plane



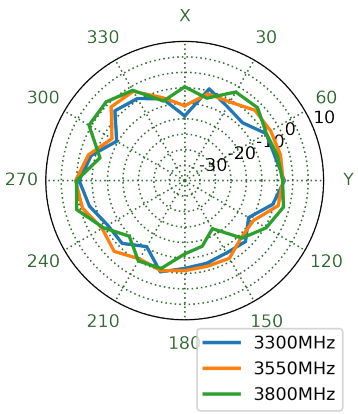
YZ Plane

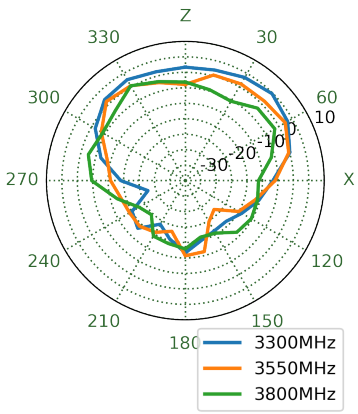


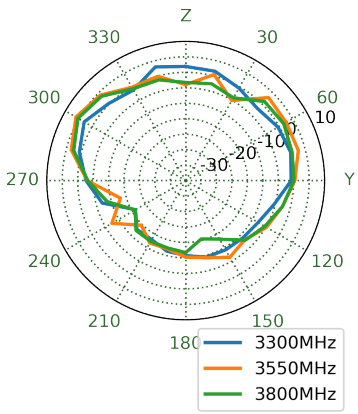
3550MHz



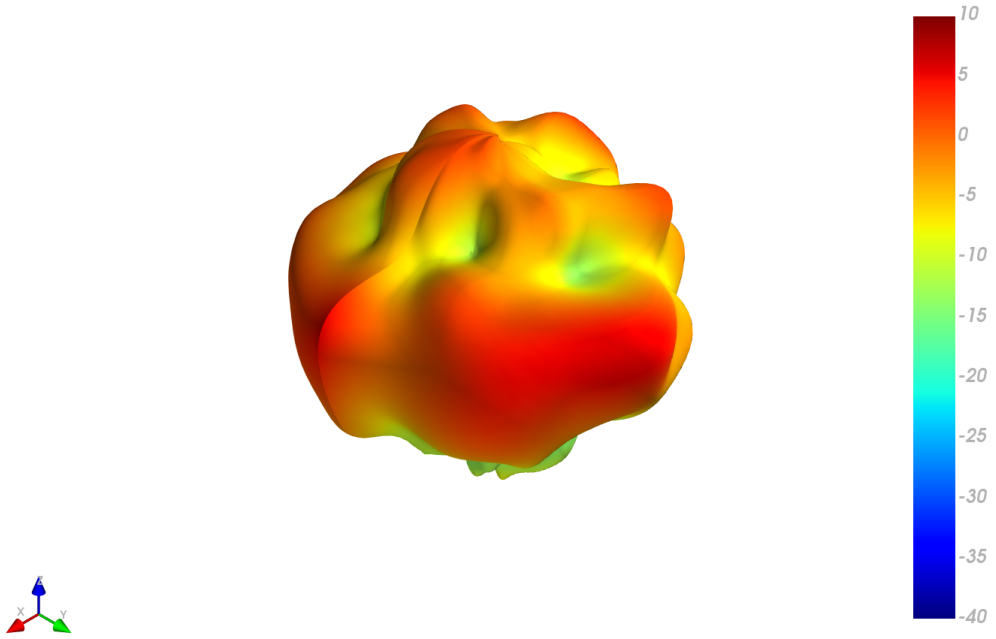
XY Plane	XZ Plane	YZ Plane



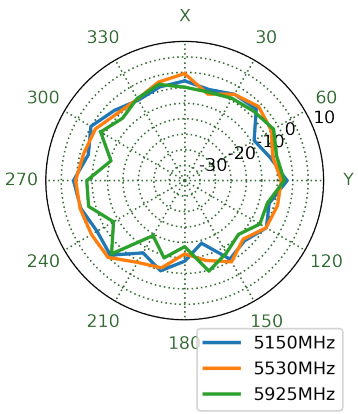


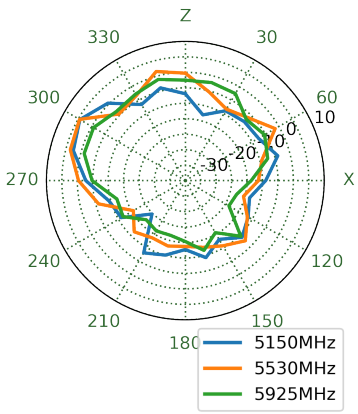


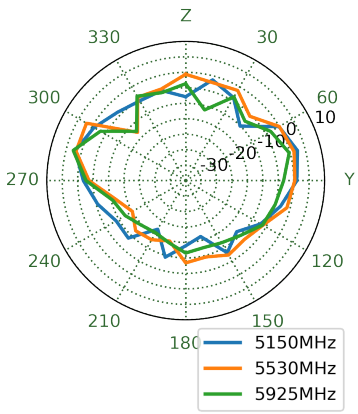
5530MHz



XY Plane	XZ Plane	YZ Plane

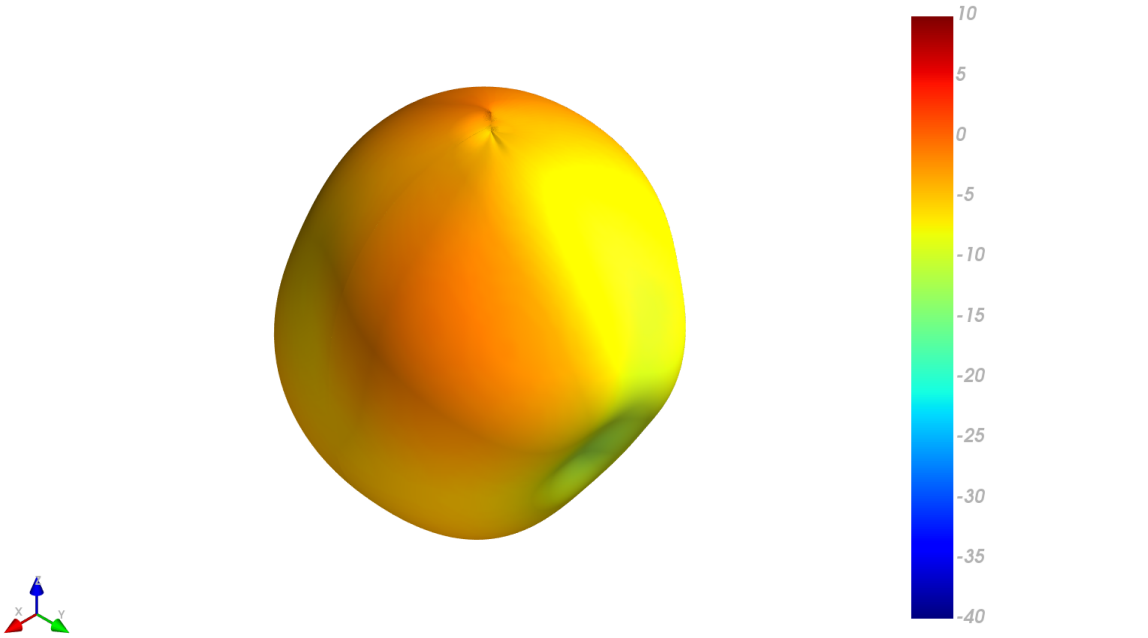


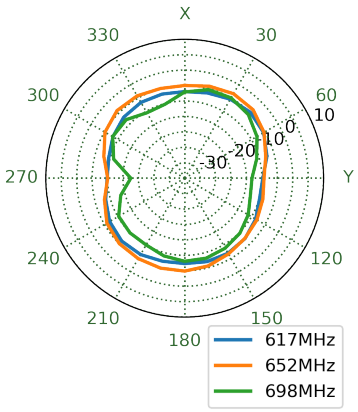
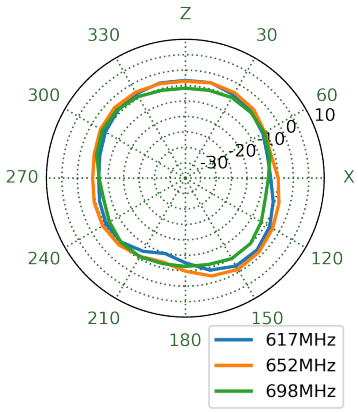
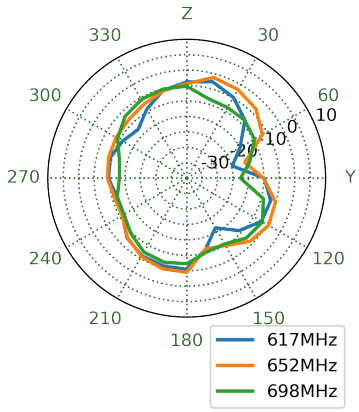




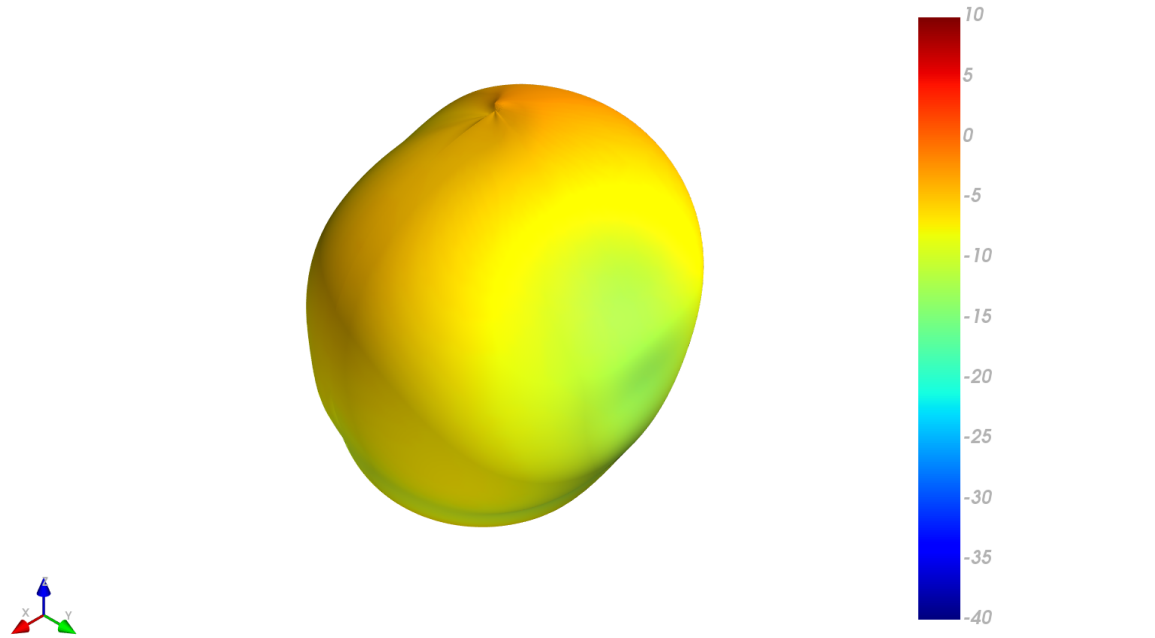
4.3 5G/4G MIMO 2 3D and 2D Radiation Patterns – 30*30cm Ground Plane

652MHz

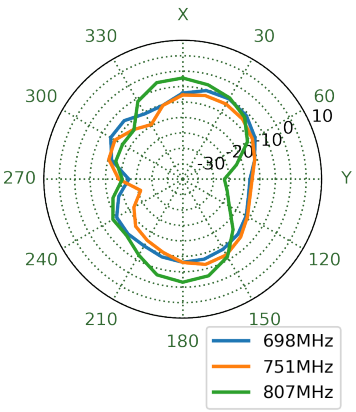


XY Plane	XZ Plane	YZ Plane
		

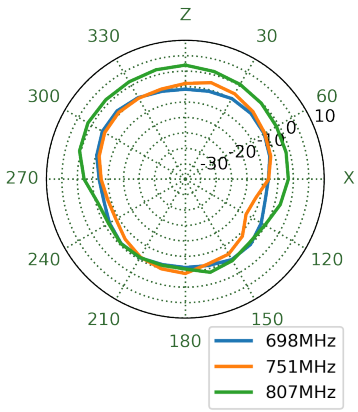
751MHz



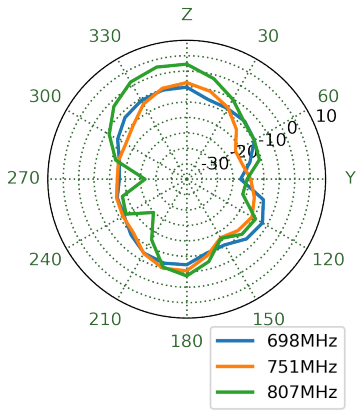
XY Plane



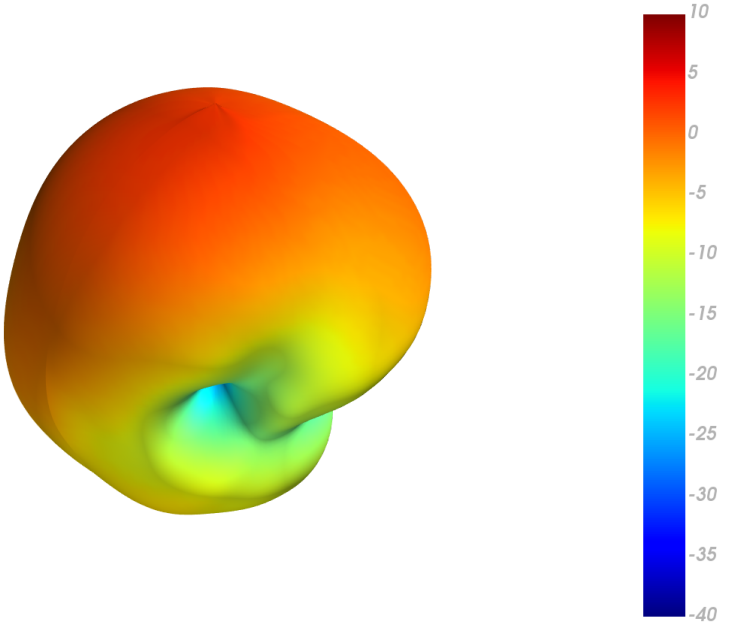
XZ Plane



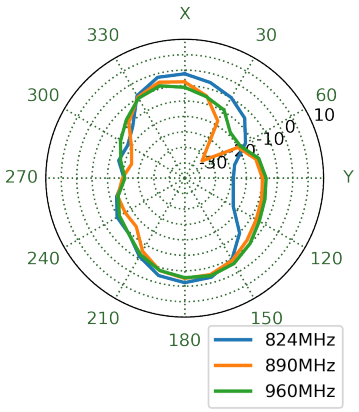
YZ Plane

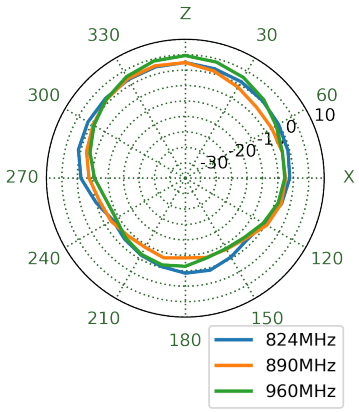


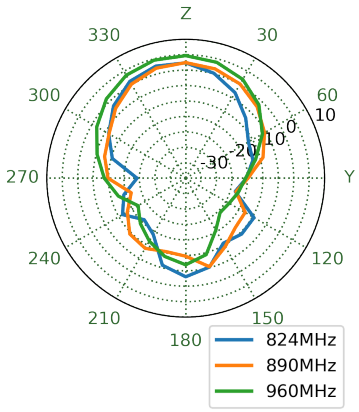
890MHz



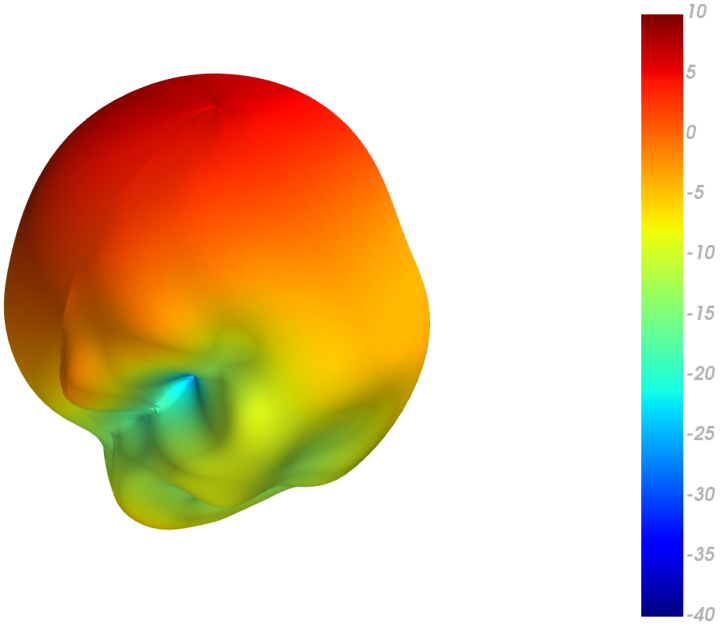
XY Plane	XZ Plane	YZ Plane



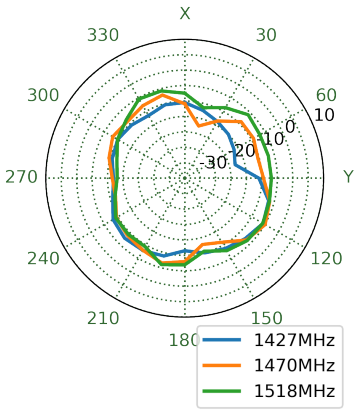


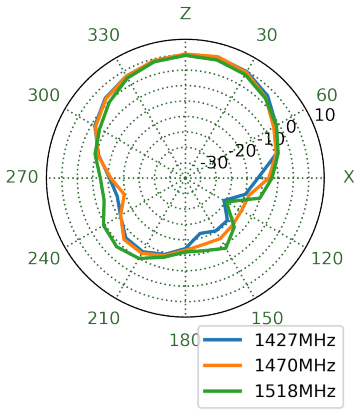


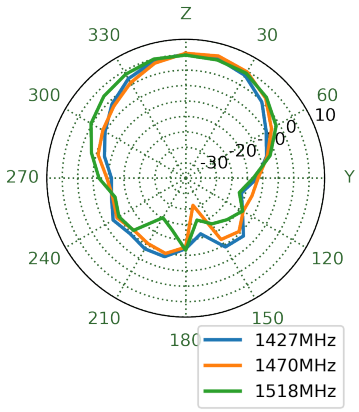
1470MHz



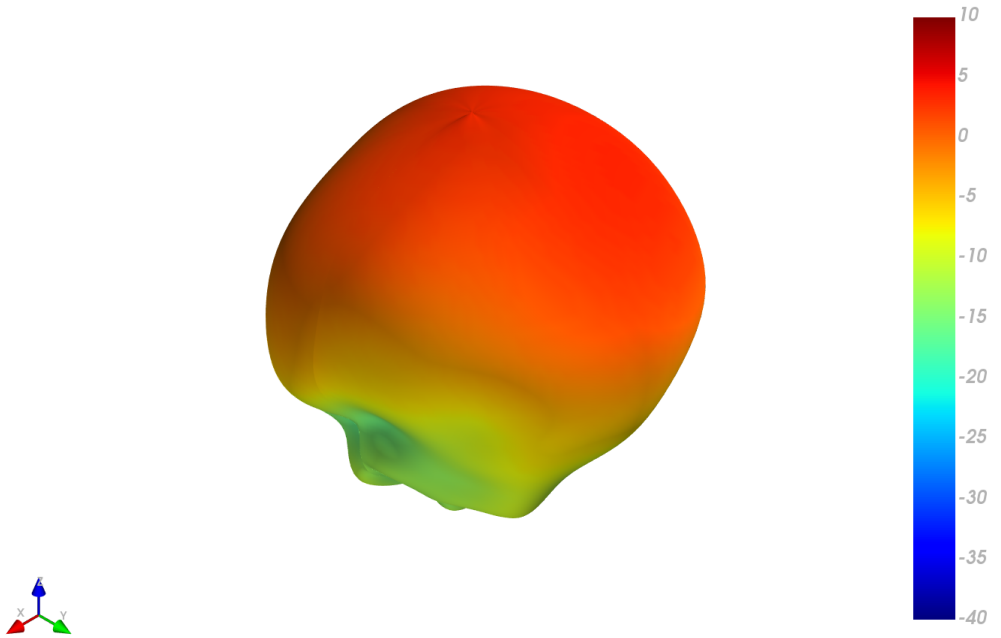
XY Plane	XZ Plane	YZ Plane



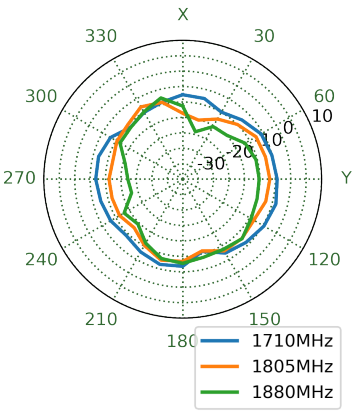




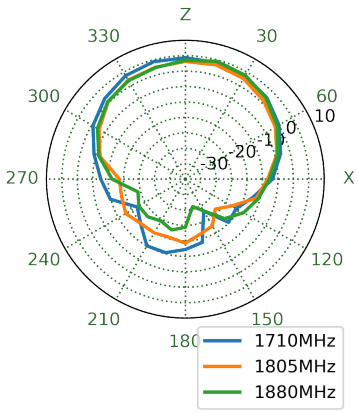
1805MHz



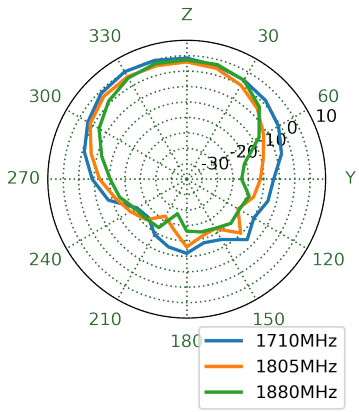
XY Plane



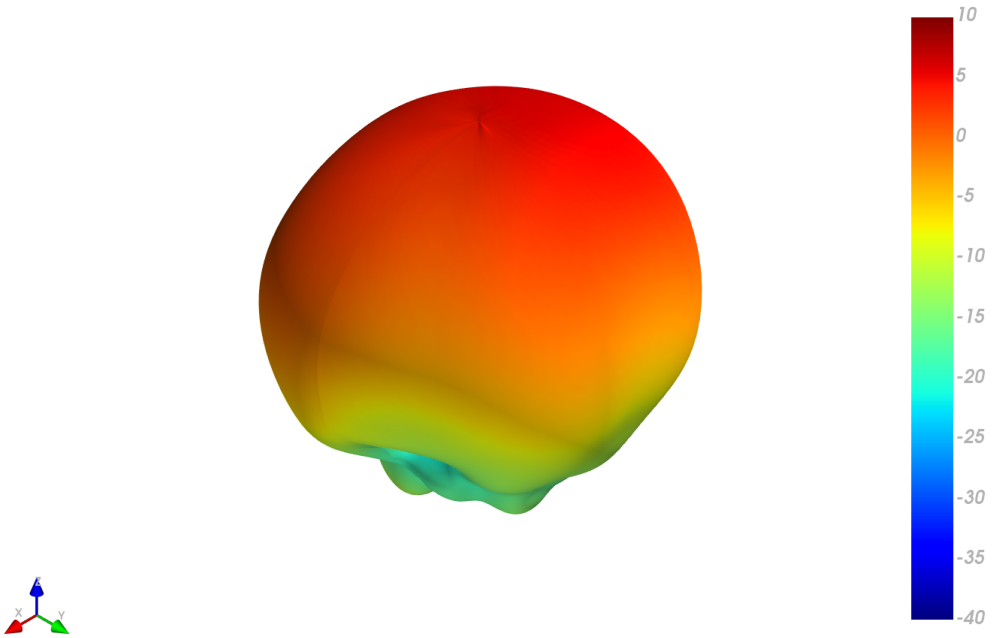
XZ Plane



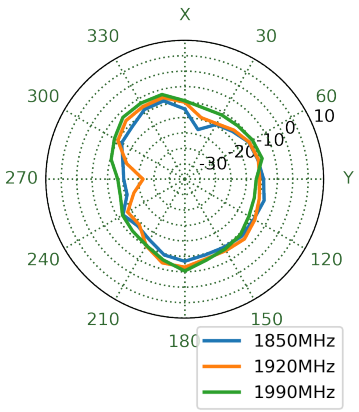
YZ Plane

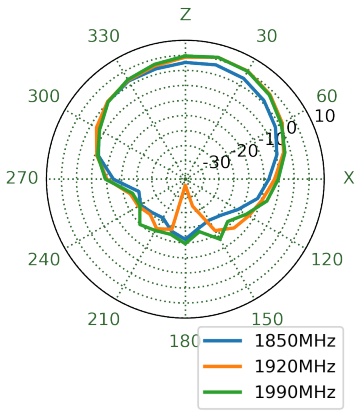


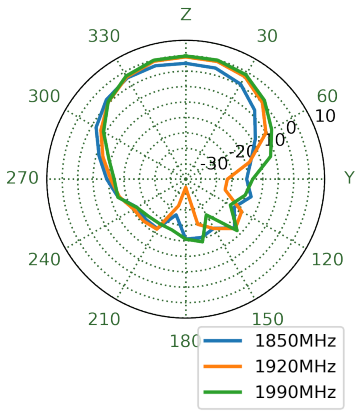
1920MHz



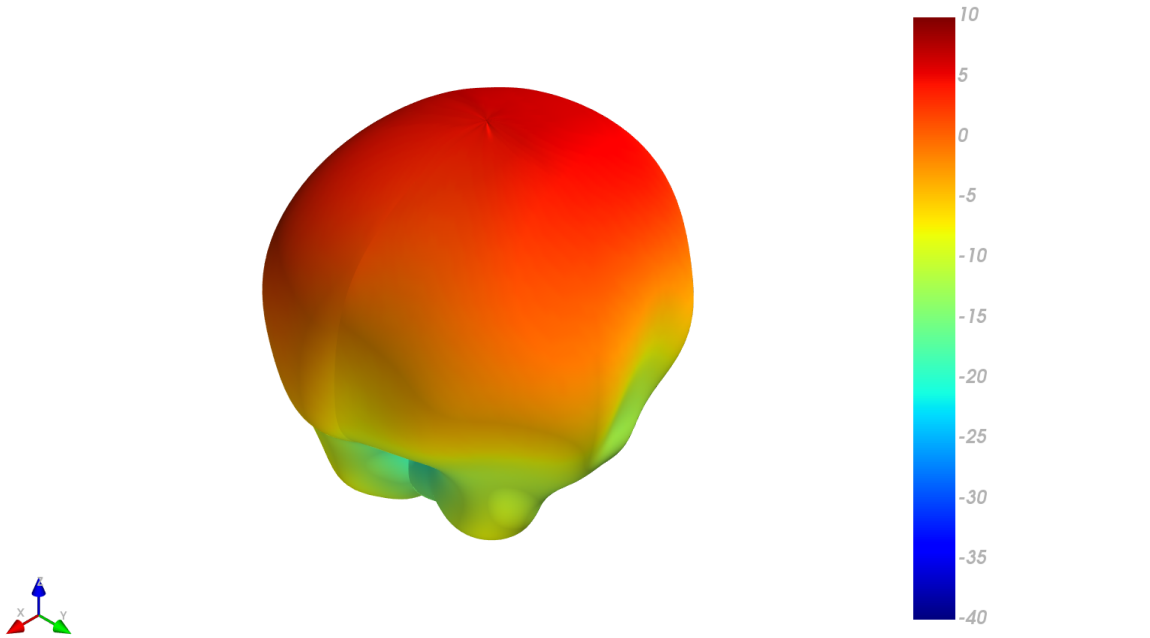
XY Plane	XZ Plane	YZ Plane



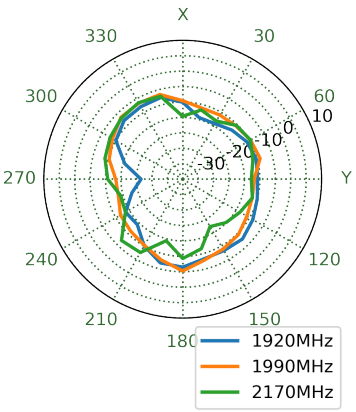




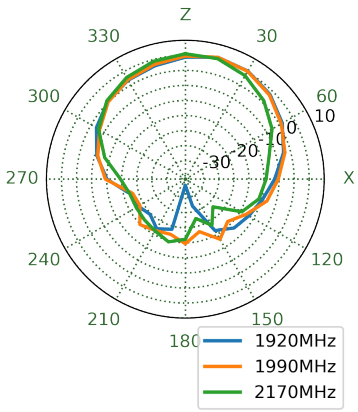
1990MHz



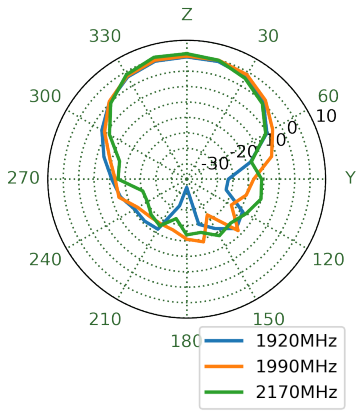
XY Plane



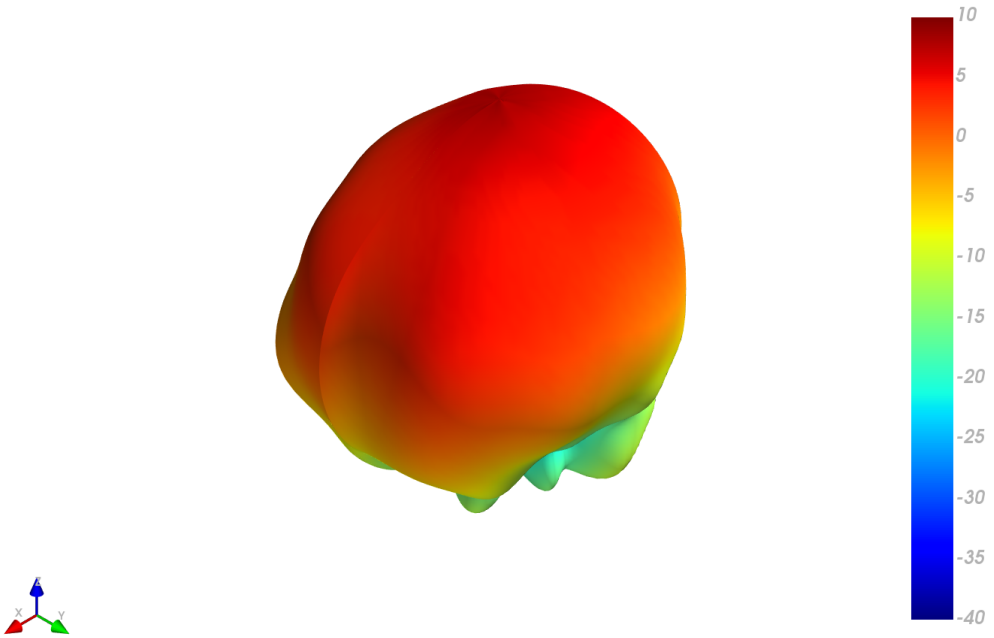
XZ Plane



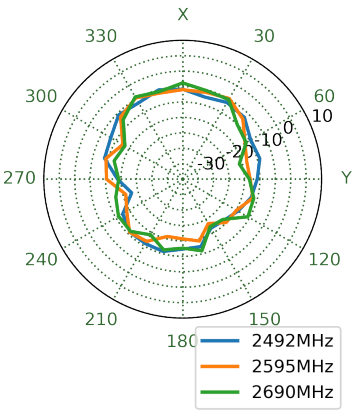
YZ Plane



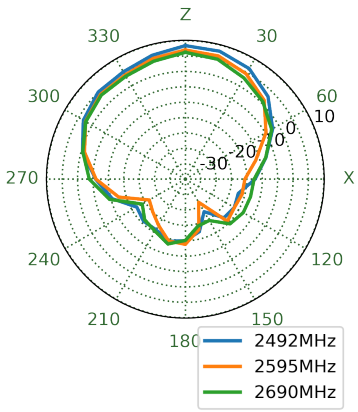
2595MHz



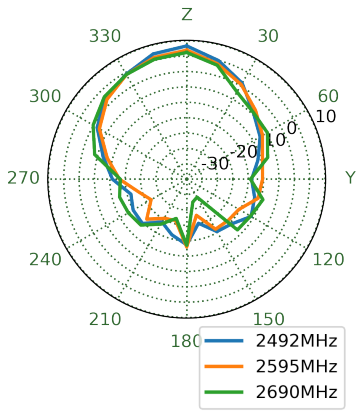
XY Plane



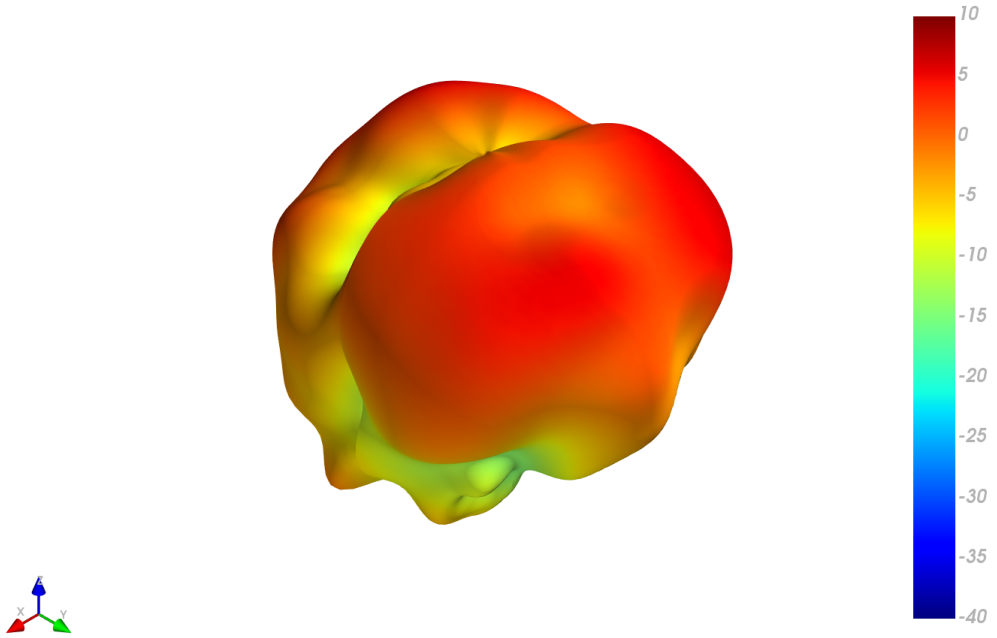
XZ Plane



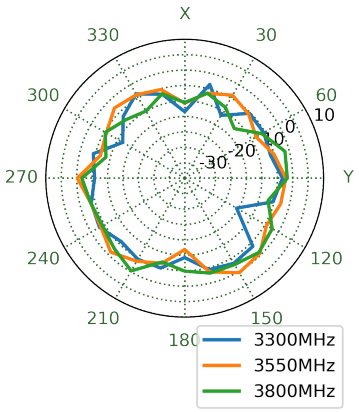
YZ Plane

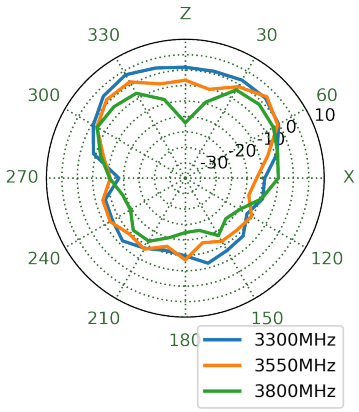


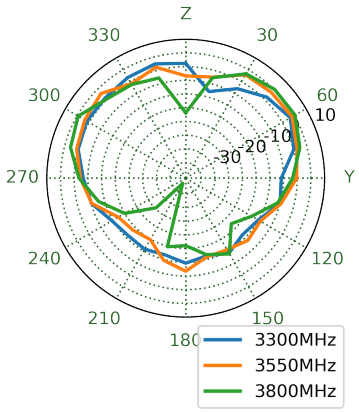
3550MHz



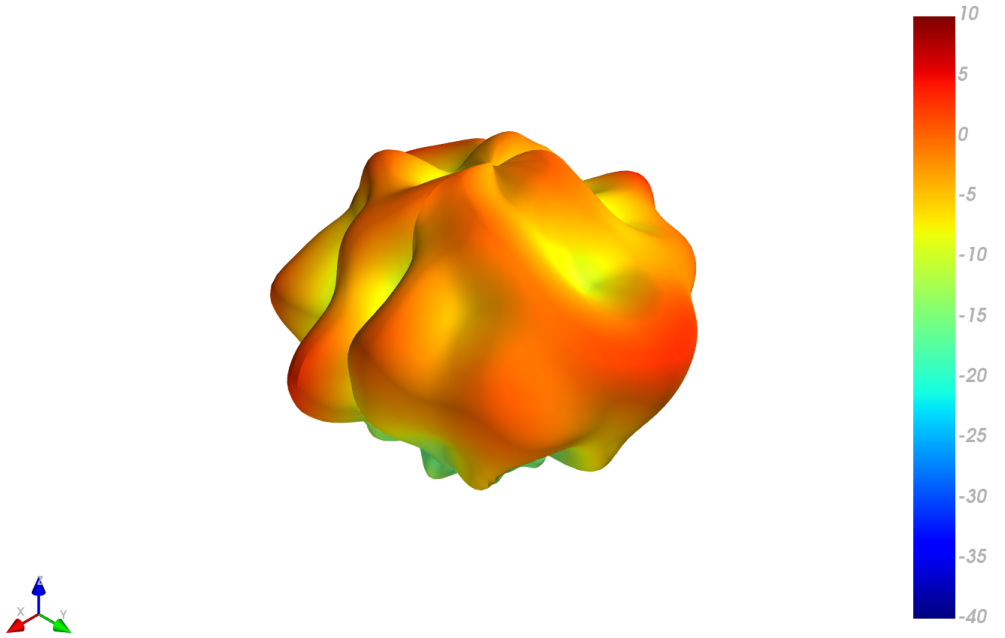
XY Plane	XZ Plane	YZ Plane



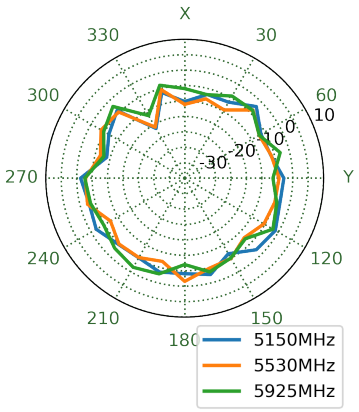


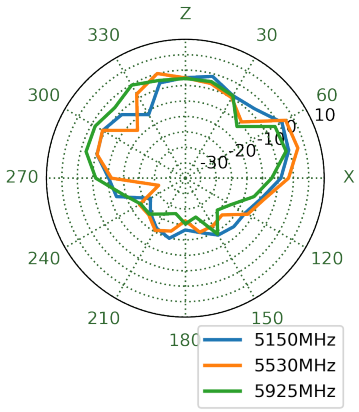


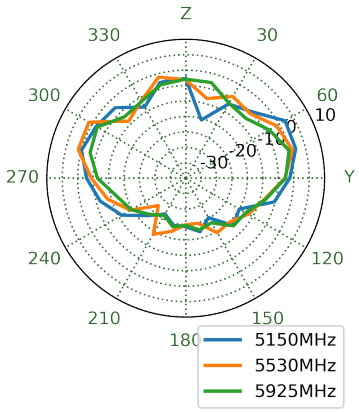
5530MHz



XY Plane	XZ Plane	YZ Plane





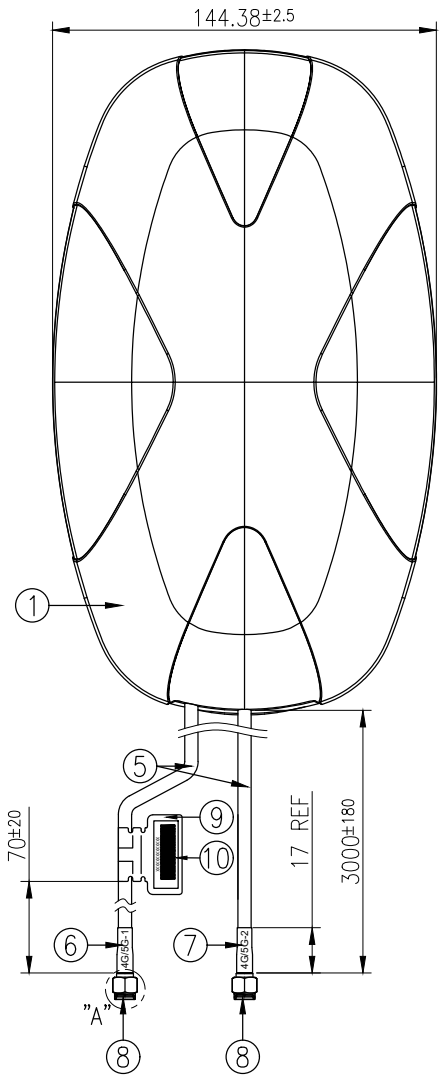


5. Mechanical Drawing (Units: mm)

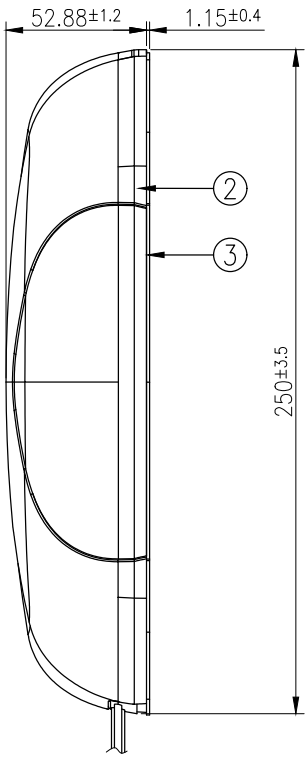
ISO NO.: EDW-20-8-0551
STATE: Release
NOTES: 1. All material must be RoHS compliant.

REV.	DESCRIPTION	ENG.	APPROVED	DATE
D01	Initial Design	Ruby	Clark	2020/06/23
D02	Modify the drawing	Aron Yan	Aaron	2021/07/15

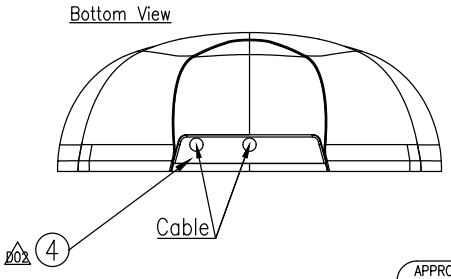
Front View

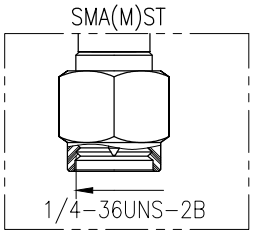


Side View



Bottom View





Detail A
Scale:4.5:1

	Name	Material	Finish	QTY
1	Steeden_Housing_Top	ABS+PC/PC345	Black	1
2	Steeden_Housing_Bottom	ABS+PC/PC345	Black	1
3	Closed Cell Foam	3M CR4305	Black	1
D02 4	Rubber	TPE	Black	1
5	TGC200 Coaxial Cable	PE	Black	2
6	Heat Shrink Tube (4G/5G-1)	PE	Red Tube/White Text	1
7	Heat Shrink Tube (4G/5G-2)	PE	Red Tube/White Text	1
8	SMA(M)ST for TGC200	Brass	Au Plated	2
9	Empty Label	PEPA	White	1
10	Barcode Label	PET	White	1

APPROVED BY:	Clark
CHECK BY:	Aaron
DRAWN BY:	Ruby
DATE:	2020/06/23
UNLESS OTHERWISE SPECFIED TOLERANCES ON:	XX.±0.5 X.±0.3 .X±0.2 .XX±0.1 .XXX±0.05
THIRD ANGLE PROJECTION	

TAOGLAS. 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.

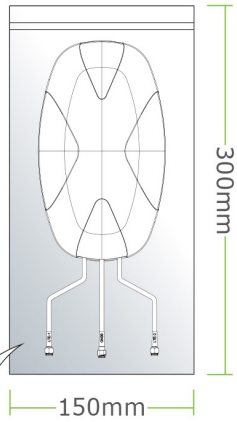
TITLE : 2in1 Steeden Magnet Mount 3m 5G/4G(1&2) TGC-200 SMA(M)

PART NO. : MA351.A.BI.001

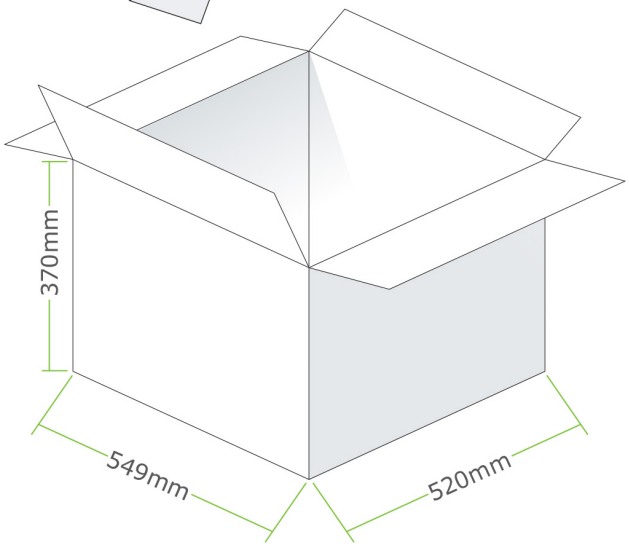
UNIT:	SCALE:	PAGES:	REV.
mm	1:2.5	1/1	D02

6. Packaging

1pc MA351.A.LBI.001 per PE Bag
PE Bag Dimensions - 300*150mm
Weight - 0.55Kg



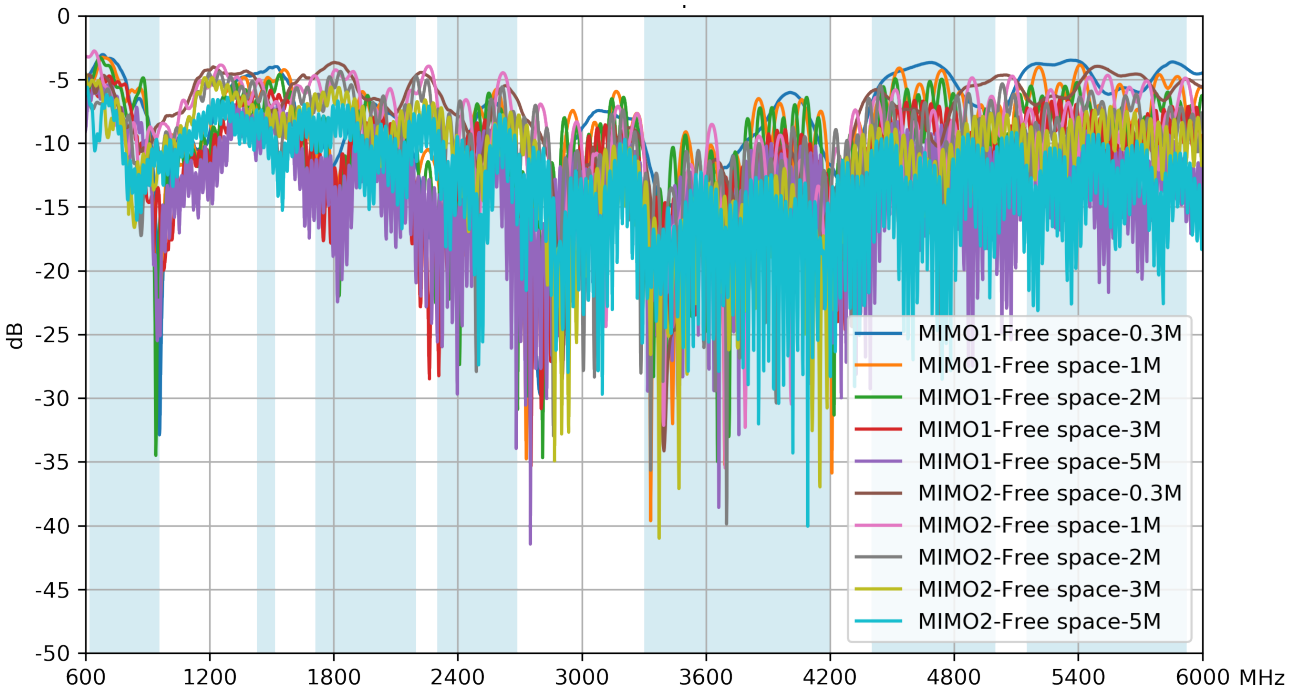
12 PE Bags per Carton
Box Dimensions - 549*520*370mm
Weight - 6.6Kg

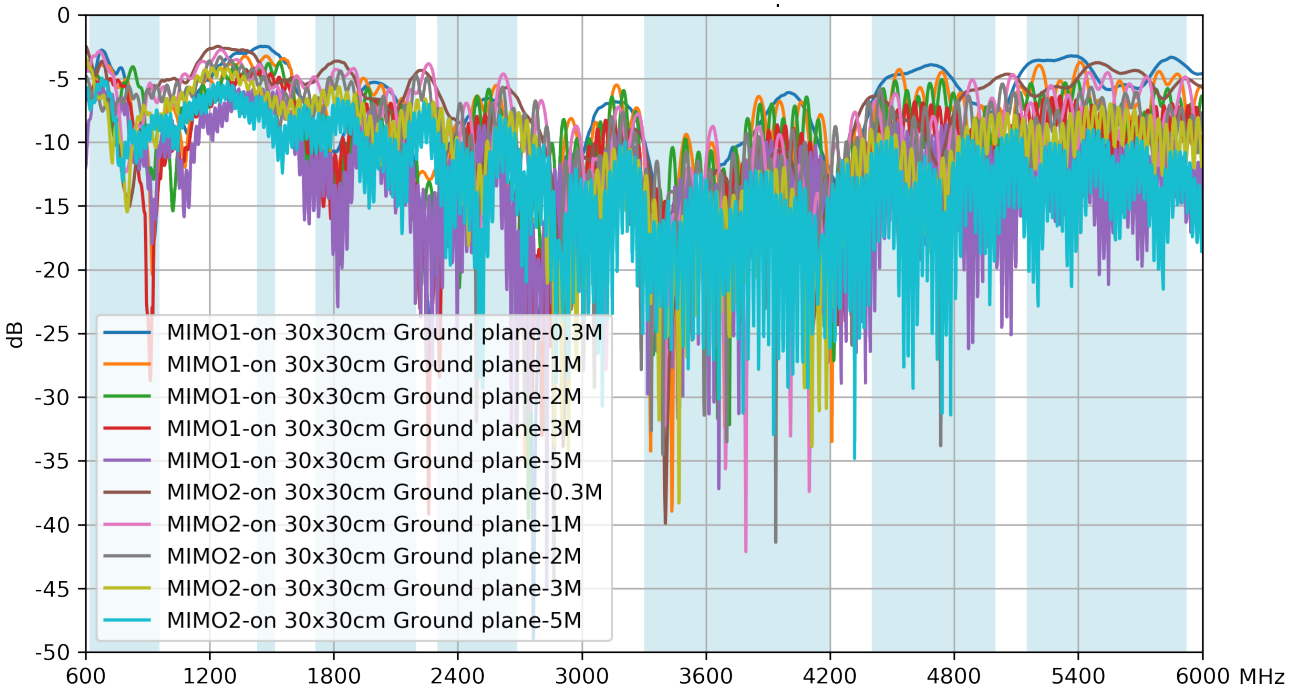


7. Application Note

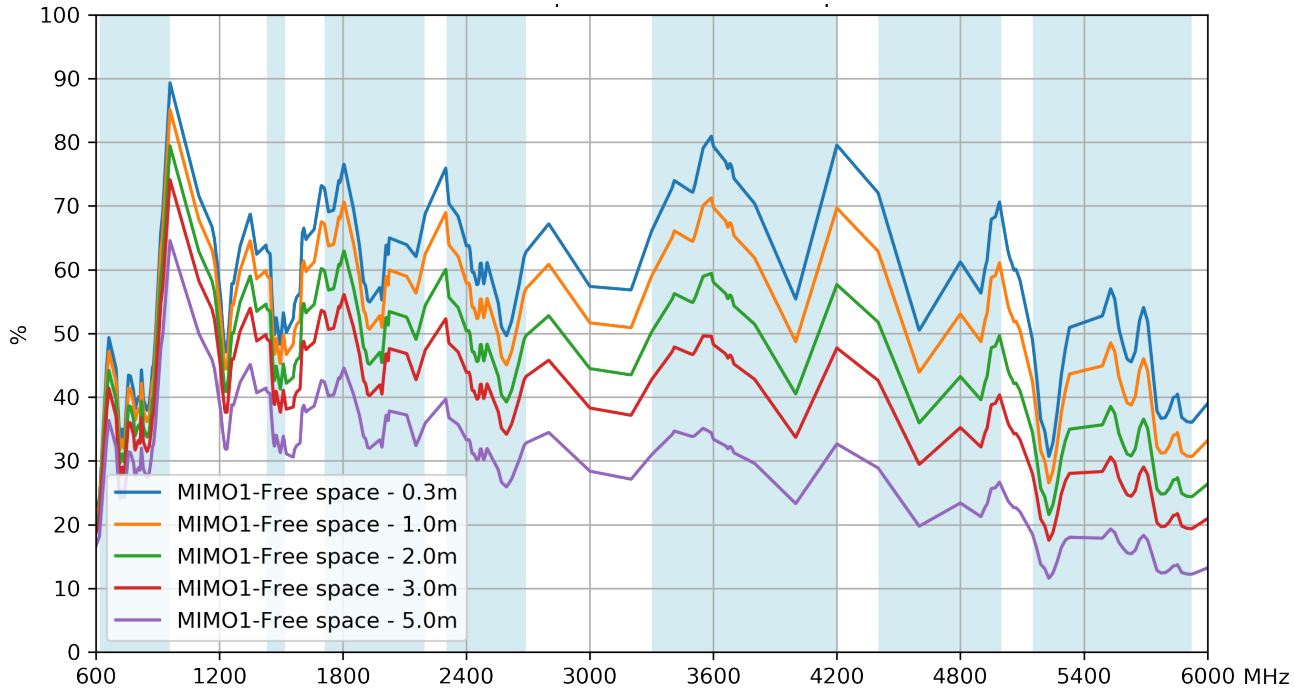
The MA351's performance can be affected by the cable length chosen by a customer, below is the 5G/4G MIMO performance over different cable lengths.

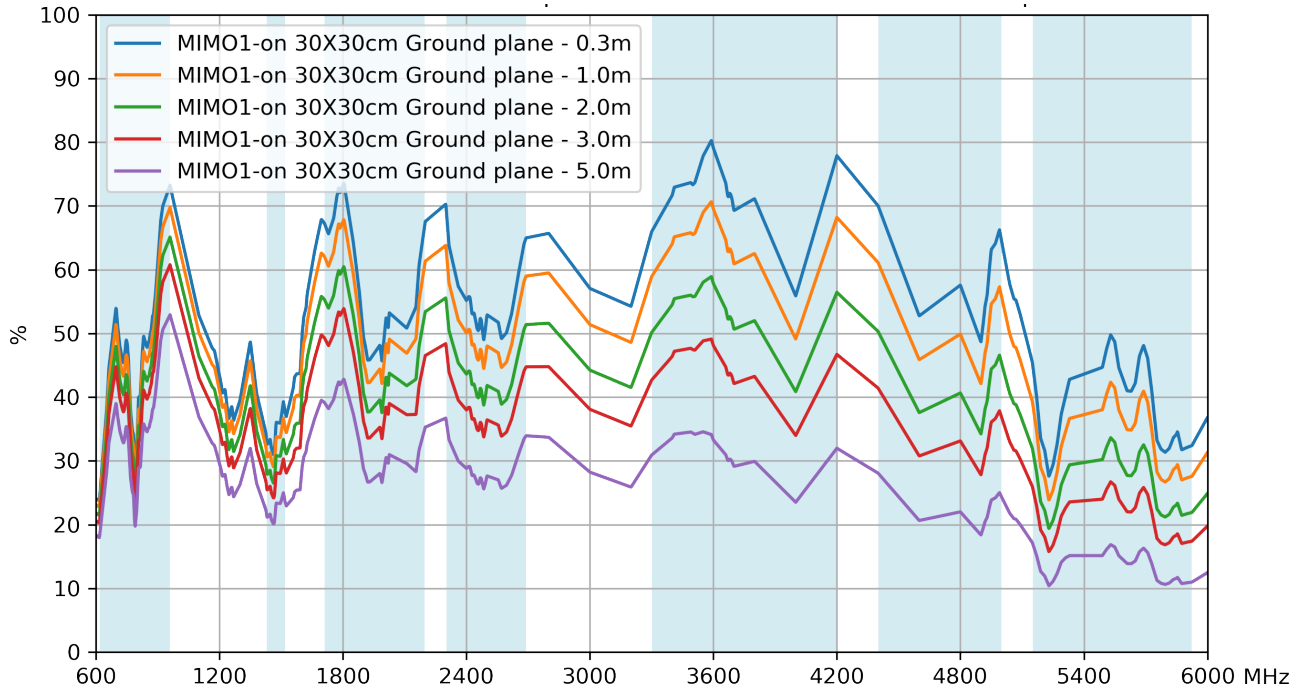
8.1 Return Loss – 5G/4G MIMO 1 & 2



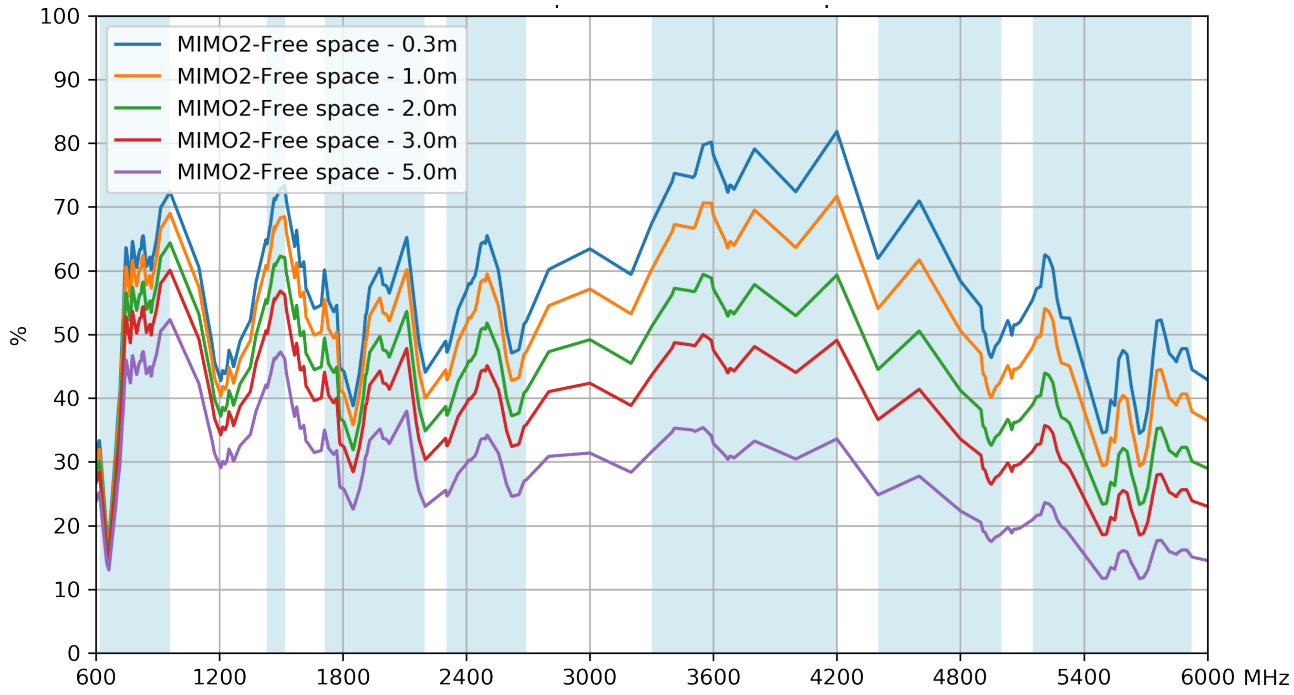


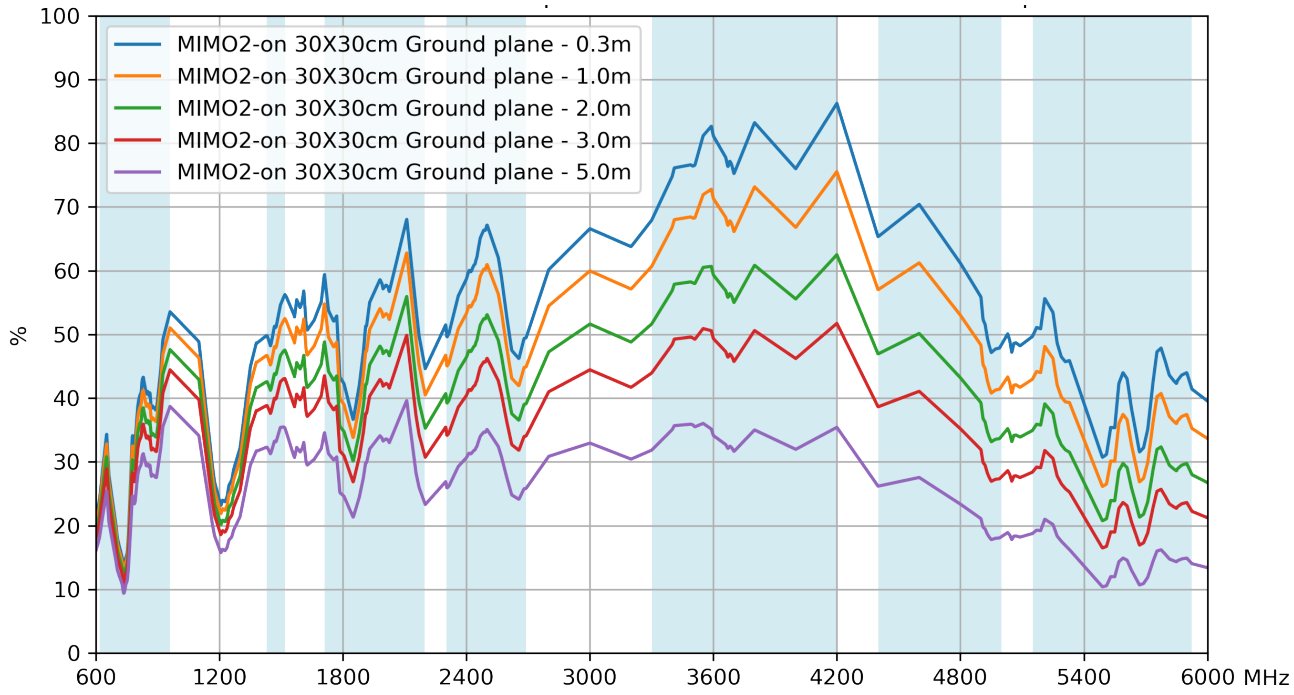
8.2 Efficiency – 5G/4G MIMO 1



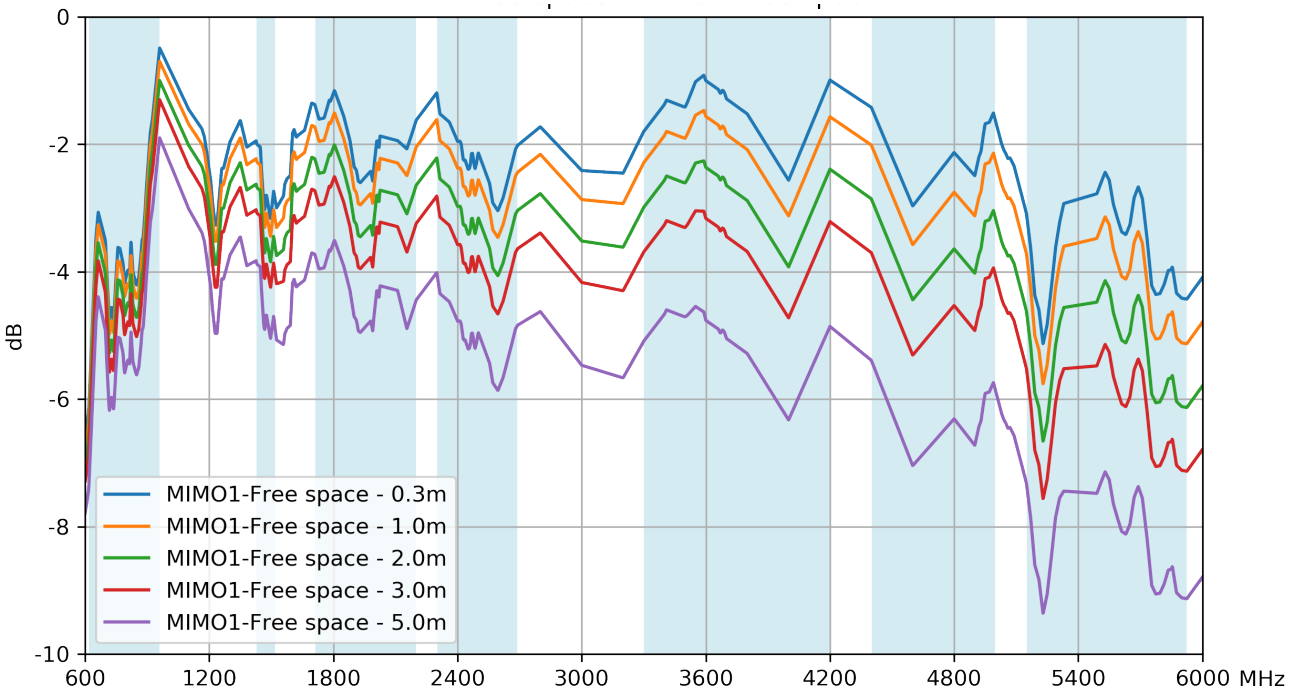


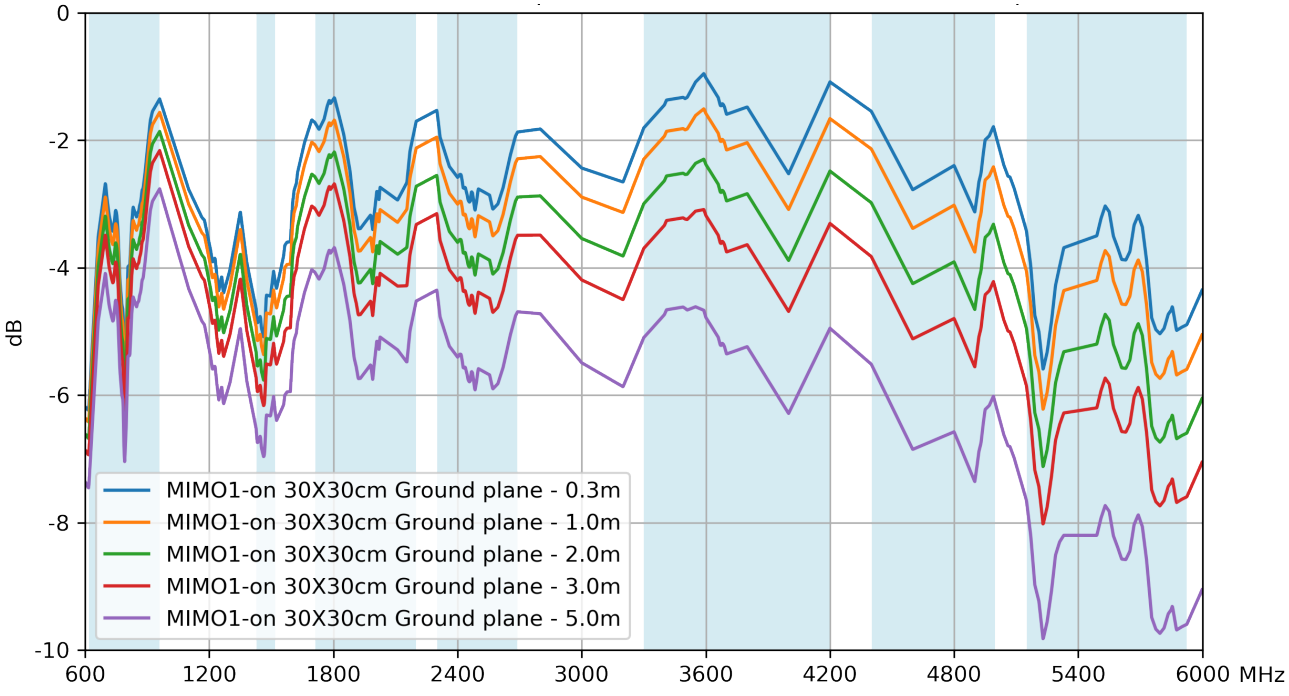
8.3 Efficiency – 5G/4G MIMO 2



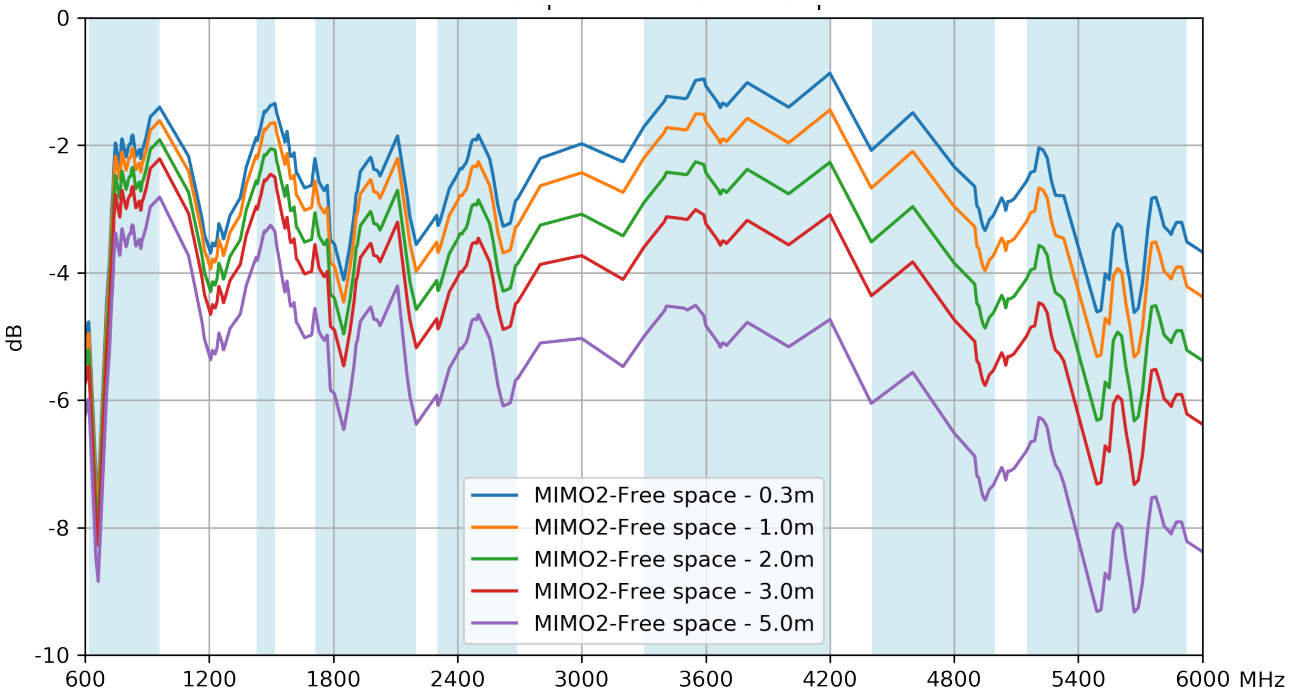


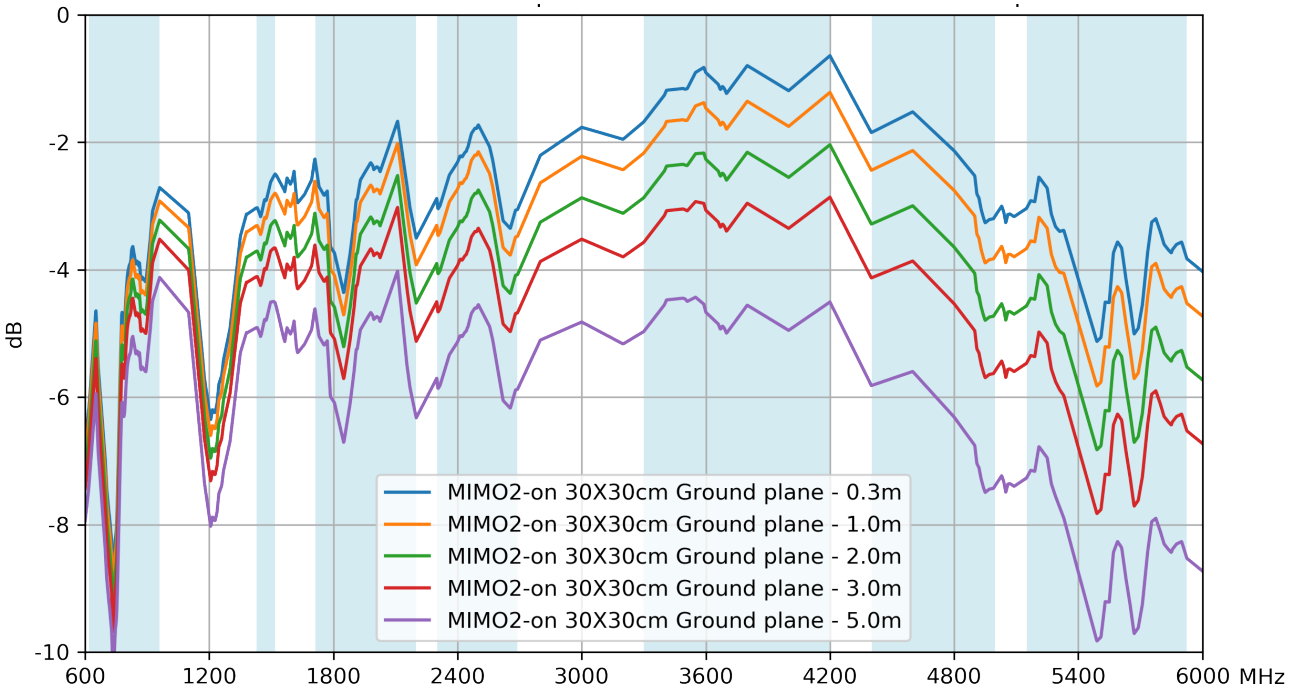
8.4 Average Gain – 5G/4G MIMO 1



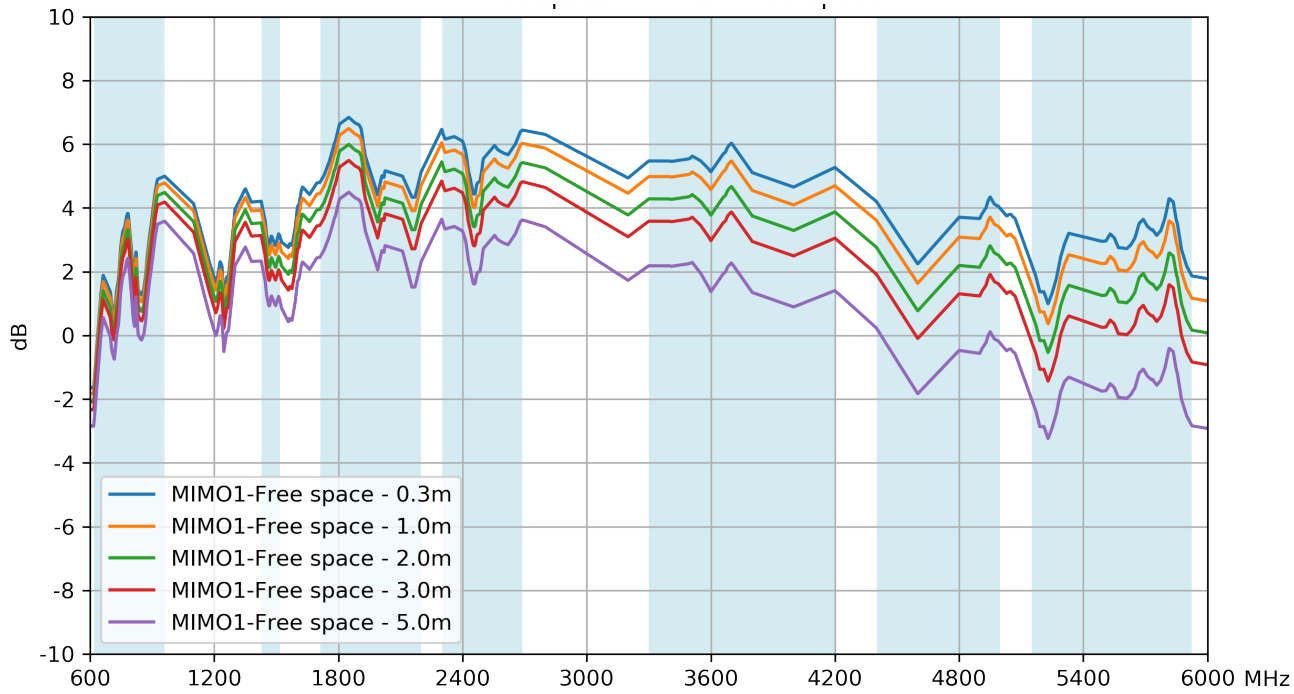


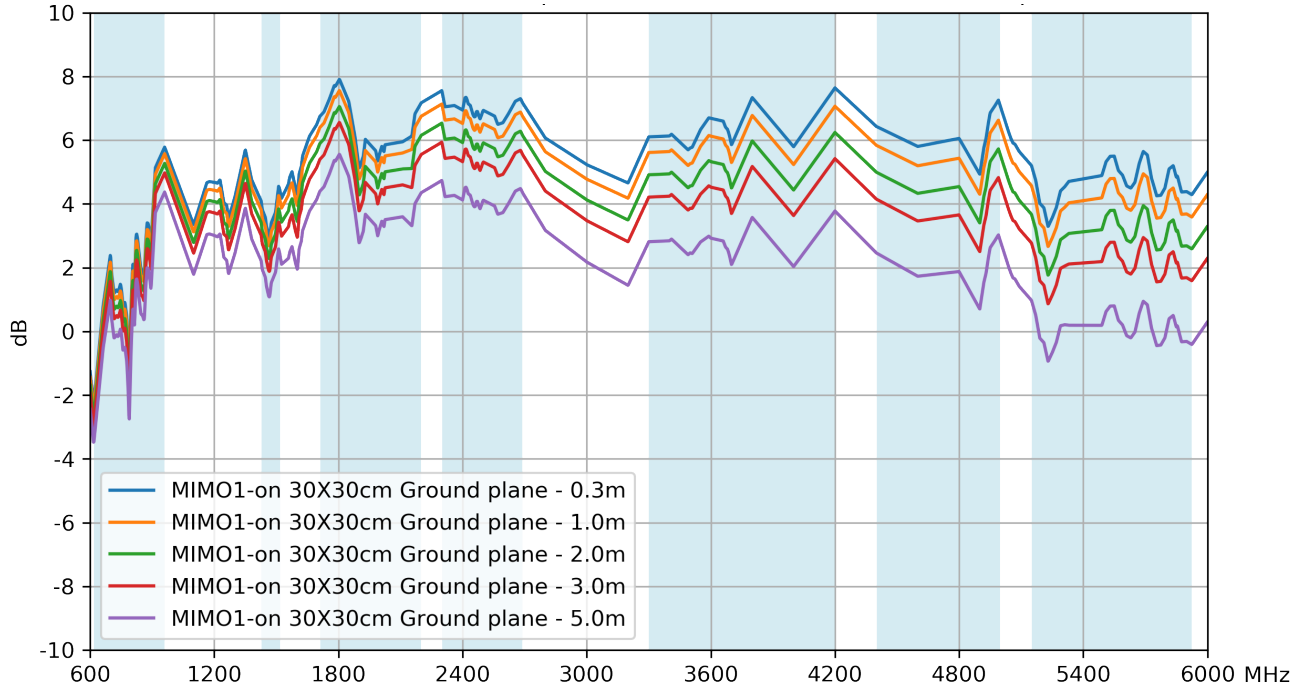
8.5 Average Gain – 5G/4G MIMO 2



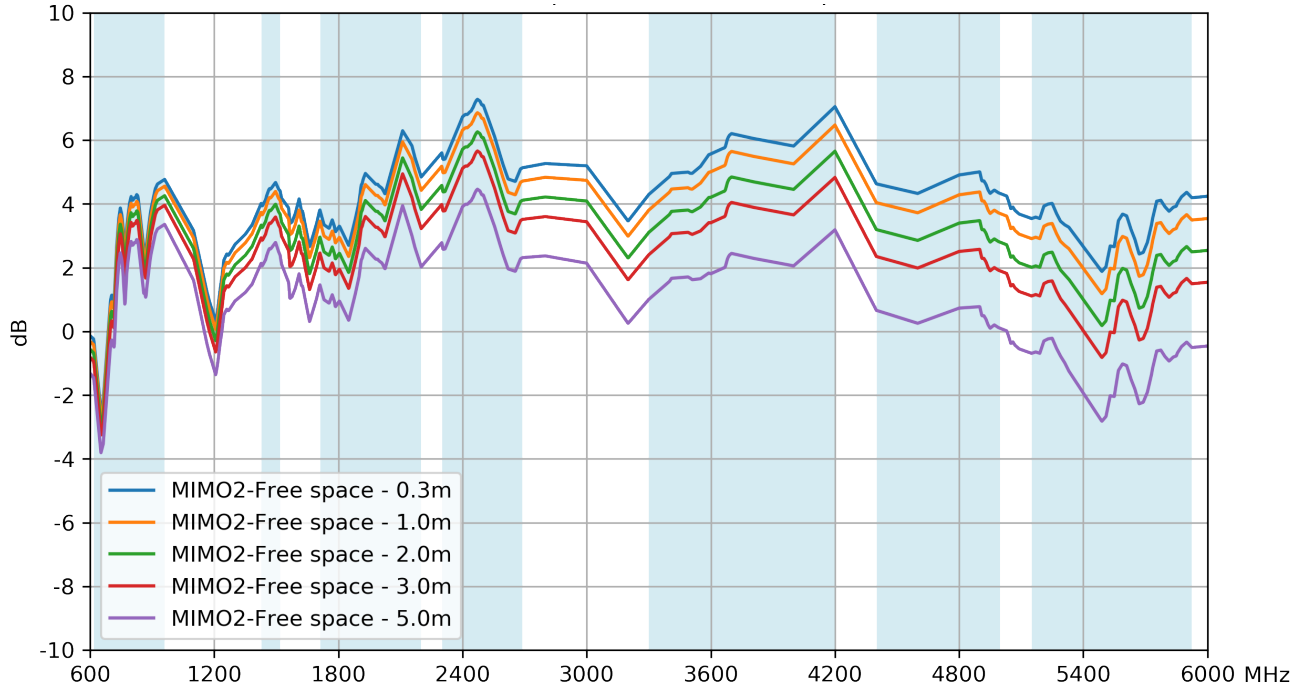


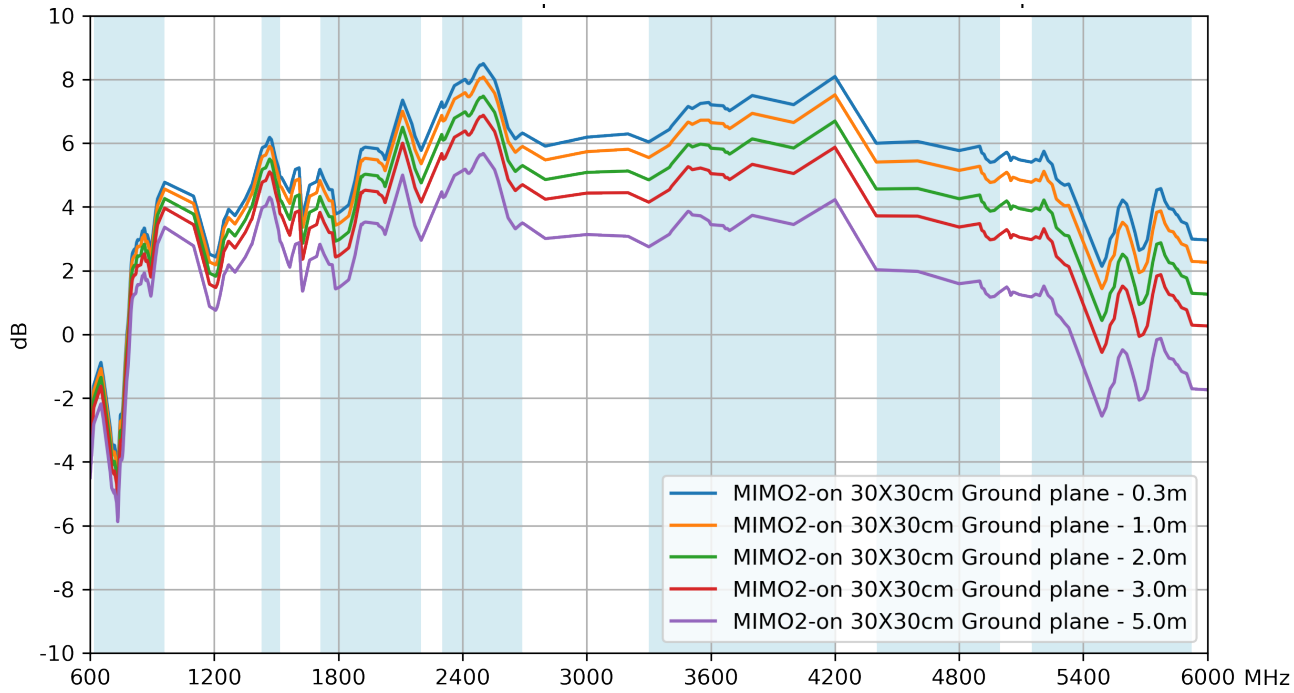
8.6 Peak Gain – 5G/4G MIMO 1





8.7 Peak Gain – 5G/4G MIMO 2





8.8 Comparison Table

5G/4G Antenna Free space											
Frequency (MHz)		5G NR Band 71	LTE700	GSM800 900	5G NR Band 1500	5GNR N66	LTE2600	5GNR N77	5GNR N78	5GNR N79	LTE5200
		617-698	698-824	824-960	1427-1518	1710-2200	2300-2690	3300-4200	3300-3800	4400-5000	5150-5925
Efficiency (%)											
MIMO1-Free space	0.3m	40.7	39.5	47.8	55.5	64.3	60.6	74.2	74.9	62.9	43.8
	1.0m	38.9	37.7	45.6	52.0	59.2	55.0	65.5	66.2	54.5	37.5
	2.0m	36.4	35.2	42.5	47.4	52.6	47.9	54.9	55.6	44.4	29.9
	3.0m	34.1	32.8	39.7	43.2	46.8	41.7	46.0	46.6	36.1	23.9
	5.0m	30.0	28.6	34.6	35.8	37.0	31.7	32.3	32.8	24.0	15.3
MIMO2-Free space	0.3m	25.7	56.7	64.2	69.7	52.9	57.4	74.8	74.6	53.2	47.5
	1.0m	24.6	54.0	61.1	65.3	48.7	52.1	66.1	65.9	46.1	40.6
	2.0m	23.1	50.4	57.0	59.4	43.3	45.4	55.4	55.3	37.6	32.5
	3.0m	21.6	47.1	53.2	54.1	38.5	39.5	46.4	46.4	30.6	26.0
	5.0m	19.0	41.0	46.4	44.9	30.4	30.0	32.6	32.6	20.3	16.7
Average Gain (dB)											
MIMO1-Free space	0.3m	-3.91	-4.03	-3.20	-2.56	-1.92	-2.17	-1.30	-1.25	-2.01	-3.58
	1.0m	-4.11	-4.24	-3.41	-2.84	-2.27	-2.59	-1.83	-1.79	-2.64	-4.26
	2.0m	-4.39	-4.54	-3.71	-3.24	-2.79	-3.19	-2.60	-2.55	-3.53	-5.24
	3.0m	-4.67	-4.84	-4.01	-3.65	-3.30	-3.79	-3.37	-3.32	-4.42	-6.21
	5.0m	-5.23	-5.44	-4.61	-4.46	-4.32	-4.99	-4.91	-4.84	-6.20	-8.16
MIMO2-Free space	0.3m	-5.90	-2.46	-1.93	-1.57	-2.76	-2.41	-1.26	-1.28	-2.74	-3.23
	1.0m	-6.09	-2.67	-2.14	-1.85	-3.12	-2.83	-1.80	-1.81	-3.36	-3.91
	2.0m	-6.37	-2.97	-2.44	-2.26	-3.63	-3.43	-2.57	-2.57	-4.25	-4.88
	3.0m	-6.65	-3.27	-2.74	-2.66	-4.14	-4.03	-3.33	-3.34	-5.14	-5.84
	5.0m	-7.21	-3.87	-3.34	-3.47	-5.16	-5.23	-4.87	-4.86	-6.92	-7.78
Peak Gain (dBi)											
MIMO1-Free space	0.3m	1.89	3.84	5.00	4.21	6.84	6.48	6.03	6.03	4.35	4.30
	1.0m	1.69	3.63	4.79	3.93	6.49	6.06	5.47	5.47	3.72	3.60
	2.0m	1.41	3.33	4.49	3.53	5.99	5.46	4.67	4.67	2.82	2.60
	3.0m	1.12	3.03	4.19	3.13	5.49	4.86	3.87	3.87	1.92	1.60
	5.0m	0.56	2.43	3.59	2.33	4.49	3.66	2.29	2.29	0.23	-0.40
MIMO2-Free space	0.3m	0.94	4.30	4.77	4.68	6.30	7.28	7.05	6.21	5.01	4.37
	1.0m	0.73	4.09	4.56	4.40	5.95	6.86	6.48	5.65	4.38	3.67
	2.0m	0.43	3.79	4.26	4.00	5.45	6.26	5.65	4.85	3.48	2.67
	3.0m	0.13	3.49	3.96	3.60	4.95	5.66	4.83	4.05	2.58	1.67
	5.0m	-0.47	2.89	3.36	2.80	3.95	4.46	3.19	2.45	0.78	-0.21

5G/4G Antenna on30x30 cm Ground plane											
Frequency (MHz)		5G NR Band 71	LTE700	GSM800 900	5G NR Band 1500	5GNR N66	LTE2600	5GNR N77	5GNR N78	5GNR N79	LTE5200
		617-698	698-824	824-960	1427-1518	1710-2200	2300-2690	3300-4200	3300-3800	4400-5000	5150-5925
Efficiency (%)											
MIMO1-on 30X30cm Ground plane	0.3m	40.1	42.5	54.0	34.5	57.4	55.0	72.3	72.9	58.5	38.5
	1.0m	38.3	40.5	51.5	32.3	52.9	49.9	63.9	64.5	50.7	32.9
	2.0m	35.9	37.8	48.0	29.4	47.0	43.5	53.5	54.1	41.3	26.3
	3.0m	33.6	35.3	44.8	26.8	41.8	37.9	44.9	45.4	33.7	21.0
	5.0m	29.5	30.7	39.0	22.2	33.0	28.7	31.5	31.9	22.3	13.4
MIMO2-on 30X30cm Ground plane	0.3m	26.5	25.9	41.9	51.5	52.0	58.9	77.6	77.2	54.3	43.0
	1.0m	25.4	24.7	39.9	48.2	47.9	53.4	68.6	68.3	47.0	36.8
	2.0m	23.8	23.1	37.3	43.9	42.6	46.5	57.4	57.3	38.3	29.4
	3.0m	22.3	21.5	34.8	40.0	37.9	40.5	48.1	48.0	31.2	23.5
	5.0m	19.6	18.7	30.3	33.2	29.9	30.7	33.8	33.8	20.8	15.1
Average Gain (dB)											
MIMO1-on 30X30cm Ground plane	0.3m	-3.97	-3.72	-2.67	-4.63	-2.41	-2.60	-1.41	-1.37	-2.33	-4.14
	1.0m	-4.16	-3.93	-2.88	-4.91	-2.77	-3.02	-1.95	-1.91	-2.95	-4.82
	2.0m	-4.45	-4.23	-3.18	-5.32	-3.28	-3.62	-2.71	-2.67	-3.84	-5.80
	3.0m	-4.73	-4.53	-3.48	-5.72	-3.79	-4.22	-3.48	-3.43	-4.73	-6.77
	5.0m	-5.30	-5.13	-4.08	-6.53	-4.82	-5.42	-5.01	-4.96	-6.51	-8.72
MIMO2-on 30X30cm Ground plane	0.3m	-5.76	-5.86	-3.78	-2.88	-2.84	-2.30	-1.10	-1.12	-2.65	-3.67
	1.0m	-5.96	-6.07	-3.99	-3.17	-3.19	-2.72	-1.64	-1.66	-3.27	-4.35
	2.0m	-6.24	-6.37	-4.29	-3.57	-3.71	-3.32	-2.41	-2.42	-4.16	-5.31
	3.0m	-6.51	-6.67	-4.59	-3.98	-4.22	-3.92	-3.18	-3.19	-5.05	-6.28
	5.0m	-7.07	-7.27	-5.19	-4.79	-5.24	-5.12	-4.71	-4.71	-6.83	-8.21
Peak Gain (dBi)											
MIMO1-on 30X30cm Ground plane	0.3m	2.42	3.09	5.78	4.56	7.91	7.56	7.64	7.34	7.26	5.65
	1.0m	2.21	2.88	5.57	4.27	7.56	7.14	7.07	6.78	6.63	4.95
	2.0m	1.91	2.58	5.27	3.85	7.06	6.54	6.24	5.98	5.73	3.95
	3.0m	1.61	2.28	4.97	3.43	6.56	5.94	5.42	5.18	4.83	2.95
	5.0m	1.01	1.68	4.37	2.60	5.56	4.74	3.78	3.58	3.03	0.97
MIMO2-on 30X30cm Ground plane	0.3m	-0.87	2.88	4.77	6.19	7.35	8.50	8.09	7.50	6.05	5.75
	1.0m	-1.07	2.67	4.56	5.91	7.00	8.08	7.52	6.94	5.44	5.12
	2.0m	-1.34	2.37	4.26	5.51	6.50	7.48	6.69	6.14	4.58	4.22
	3.0m	-1.62	2.07	3.96	5.11	6.00	6.88	5.87	5.34	3.72	3.32
	5.0m	-2.17	1.47	3.36	4.31	5.00	5.68	4.23	3.86	2.03	1.52

Changelog for the datasheet

SPE-20-8-077 – MA351.A.BI.001

Revision: B (Current Release)	
Date:	2021-01-28
Notes:	Replaced MA351 drawing
Author:	Erik Landi

Previous Revisions

Revision: A (Original First Release)	
Date:	2020-07-02
Notes:	
Author:	Jack Conroy

TAOGLAS®

www.taoglas.com



© Taoglas

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Taoglas:

MA351.A.BI.001