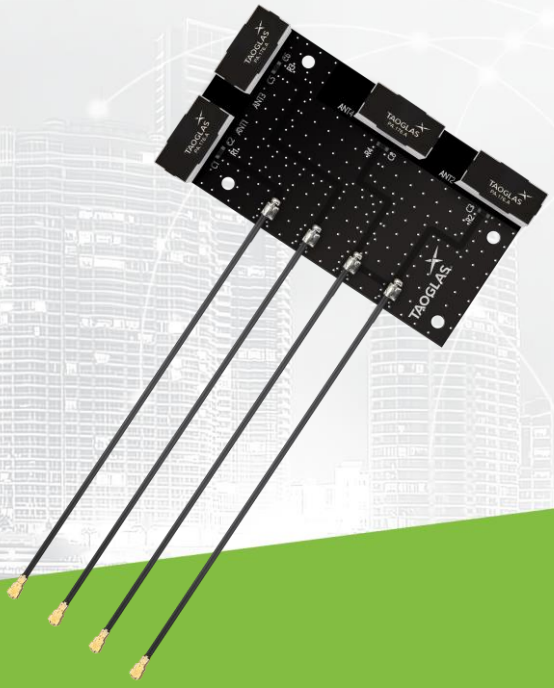
TAOGLAS



Datasheet

High-band 5G 4x4 MIMO Antenna Board

Part No:
MAT.176C

Description:

High-Band 5G Antenna Board (45x84mm) with 4x4 MIMO operation

Features:

Covering 1.7 - 6GHz

Antenna Board with 4x4 MIMO

High Efficiency across all cellular High-Bands

Dimensions: 84 x 45mm

Manufactured in our IATF16949 Certified Facility

Cables: 100mm of 1.13

Connectors: I-PEX MHF®4L

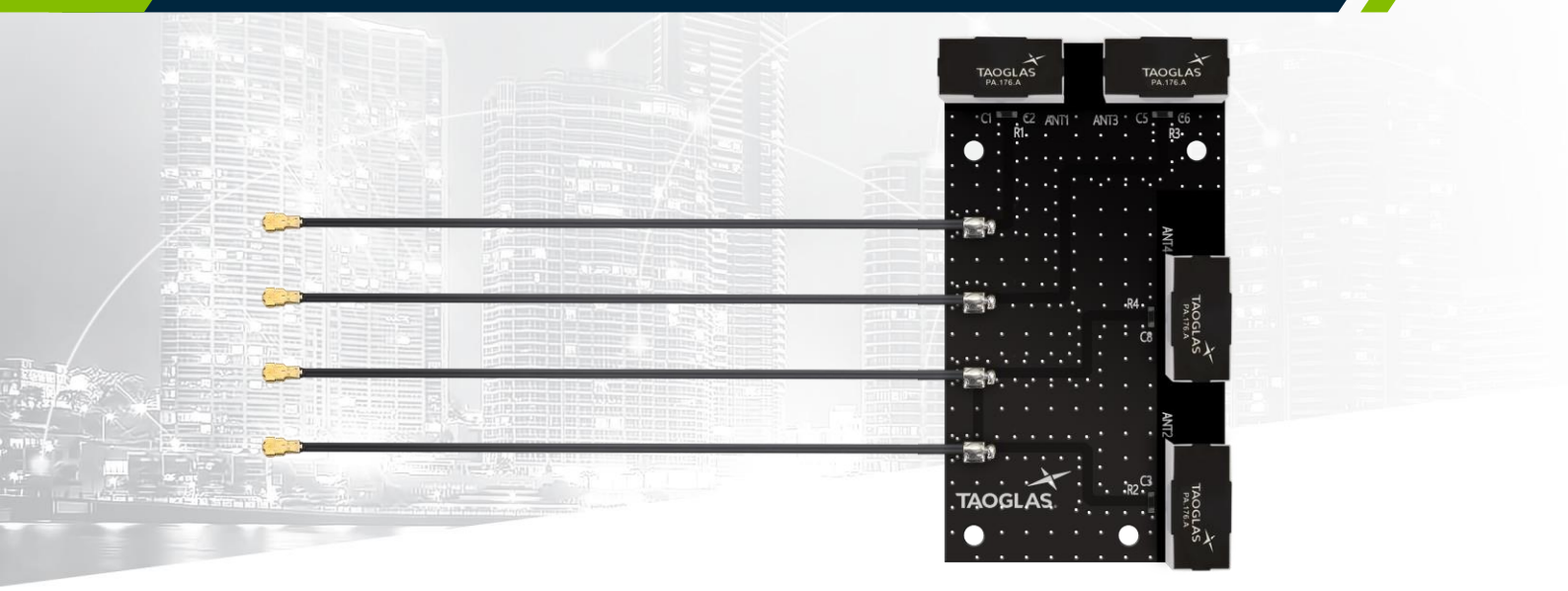
CE Certified, RoHS & REACH Compliant

CE

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1. Introduction



The MAT.176C is a patent-pending, 5G/4G high-band cellular antenna board. The MAT.176C has been designed with 4 PA.176 antennas integrated on to one small antenna board – just 85*45mm. The MAT.176C is used for applications that require 4 high performing MIMO antennas on one board. It provides very high efficiency and gain across multiple cellular bands, operating between 1.7 - 6GHz. The MAT.176C has been designed to be used in conjunction with the next generation of 5G MIMO modules and routers.

Typical cellular applications include:

- Telematic Control and On-board Diagnostic Units
- First Responder and Public Safety Devices
- UAV's and Robotics
- Media and Smart Home

The MAT.176C is manufactured in Taoglas' IATF16949 Certified Facility and is suitable for automotive applications.

Taoglas provides optimization services for matching, and active TRP, TIS and RSE testing. The cable lengths and connectors are fully customizable subject to MOQ and NRE, for further information please contact your regional Taoglas customer support team.

2. Specifications

Electrical									
Band	**Frequency (MHz)**		**Efficiency (%)**	**Average Gain (dB)**	**Peak Gain (dBi)**	**VSWR**	**Impedance**	**Polarization**	**Radiation Pattern**
4G/3G Band 3,4,9,25,35,66	1710~1880	MIMO 1	49.4	-3.07	2.76	<3:1	50 Ω	Linear	Omni
		MIMO 2	65.0	-1.87	3.18				
		MIMO 3	55.6	-2.55	1.21				
		MIMO 4	49.3	-3.07	2.08				
4G/3G Band 1,2,3,9,25,35,39	1850~1990	MIMO 1	68.7	-1.63	3.64				
		MIMO 2	64.2	-1.92	3.88				
		MIMO 3	48.1	-3.17	1.54				
		MIMO 4	42.1	-3.75	0.19				
4G/3G Band 1,2,4,23,25	1920~2170	MIMO 1	62.6	-2.03	3.64				
		MIMO 2	62.7	-2.03	3.88				
		MIMO 3	45.2	-3.45	1.99				
		MIMO 4	41.3	-3.84	0.56				
4G/3G Band 7,30,38,40,41	2300~2690	MIMO 1	41.6	-3.81	3.60				
		MIMO 2	56.1	-2.51	5.06				
		MIMO 3	44.8	-3.49	2.82				
		MIMO 4	38.4	-4.15	1.43				
5G/4G Band 22,42,78	3300~3500	MIMO 1	58.8	-2.30	2.89				
		MIMO 2	54.1	-2.67	3.28				
		MIMO 3	56.3	-2.50	2.17				
		MIMO 4	52.7	-2.78	3.07				
5G/4G Band 22,42,43,48,77,78,79	3200~4650	MIMO 1	61.4	-2.12	3.53				
		MIMO 2	60.8	-2.16	3.86				
		MIMO 3	52.1	-2.83	3.73				
		MIMO 4	60.9	-2.15	4.39				
Greater than 5GHz	5150~5925	MIMO 1	44.9	-3.48	3.68				
		MIMO 2	47.1	-3.27	4.44				
		MIMO 3	37.6	-4.25	2.22				
		MIMO 4	52.8	-2.77	2.97				

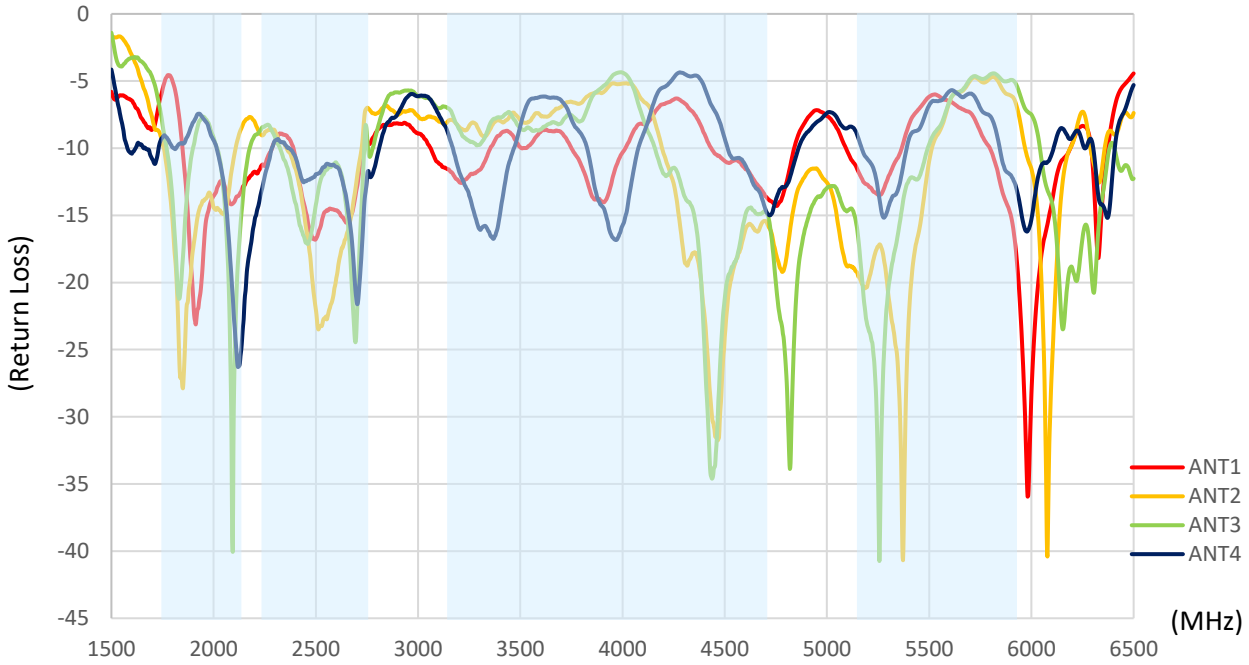
Mechanical	
Dimension	84*45 mm
Antenna Material	Ceramic
Board Material	FR4
Connector	I-PEX MHF 4L
Cable	100mm of 1.13
Environmental	
Temperature Range	-40°C to 85°C
Moisture Sensitivity	Level 3

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		✗
77	3300 to 4200		✓
78	3300 to 3800		✓
79	4400 to 5000		✓
126	410 to 430		✗

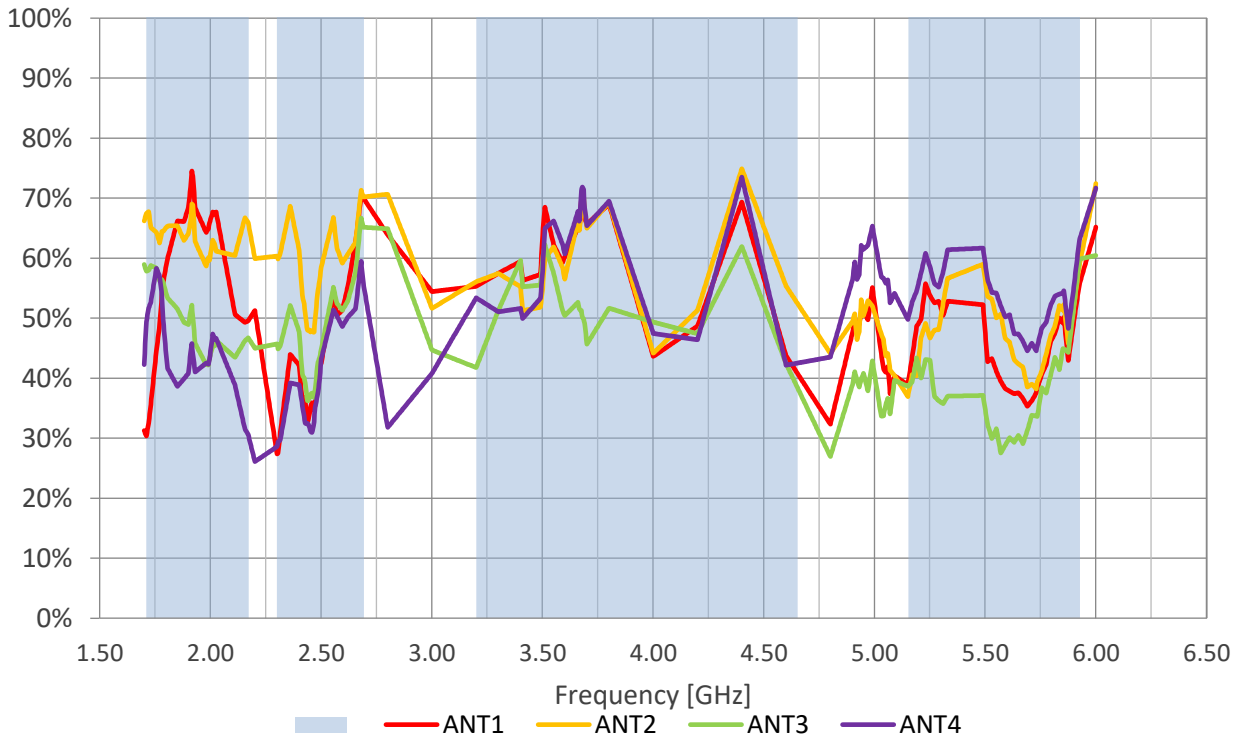
*Covered bands represent those with greater than 20% efficiency

3. Antenna Characteristics

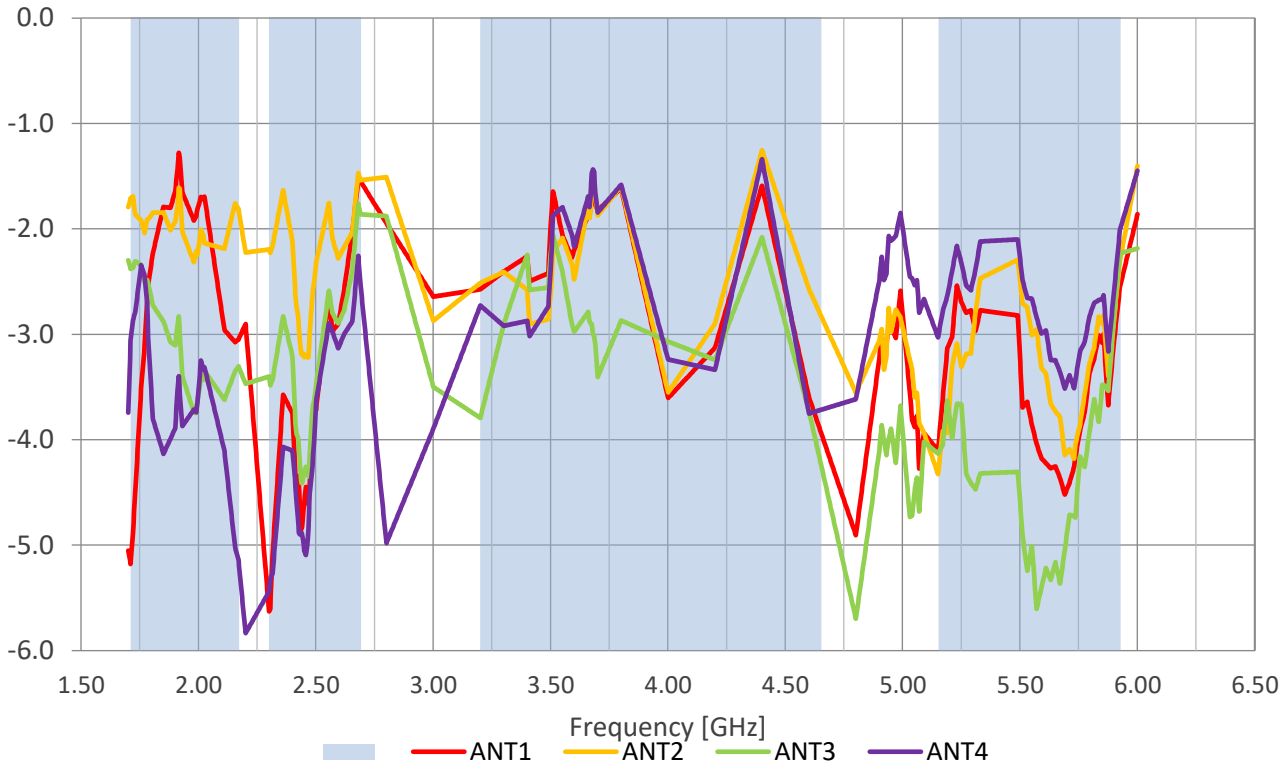
3.1 Return Loss



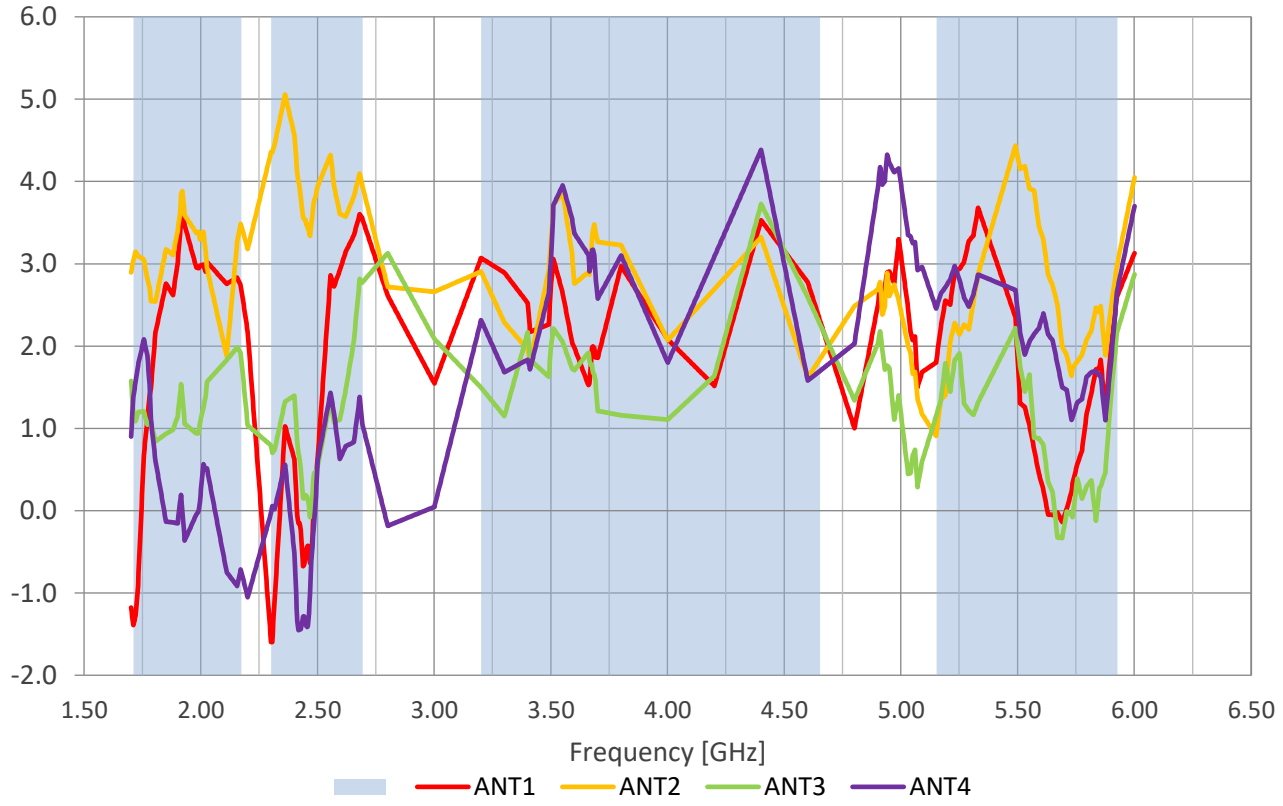
3.2 Efficiency



3.3 Average Gain

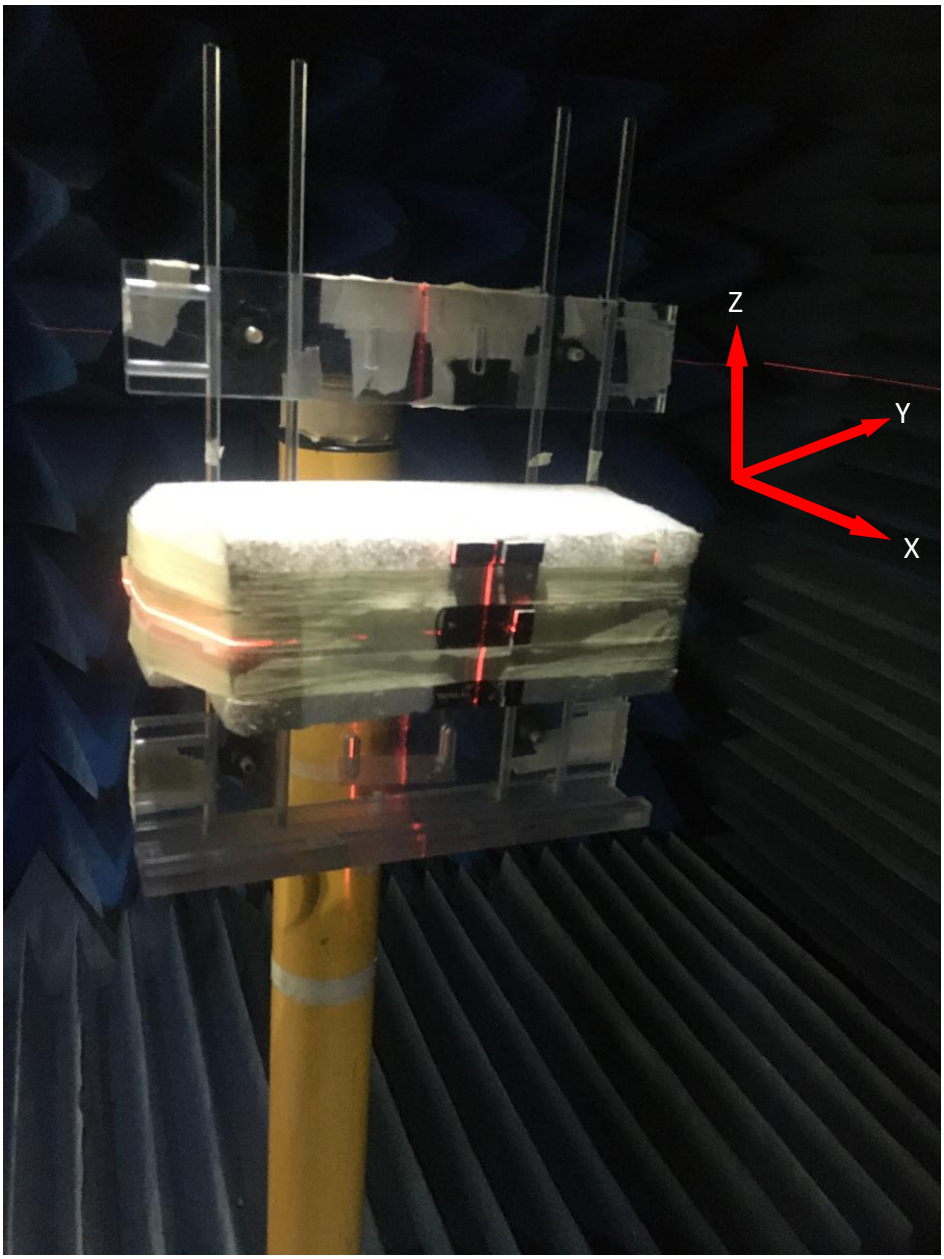


3.4 Peak Gain



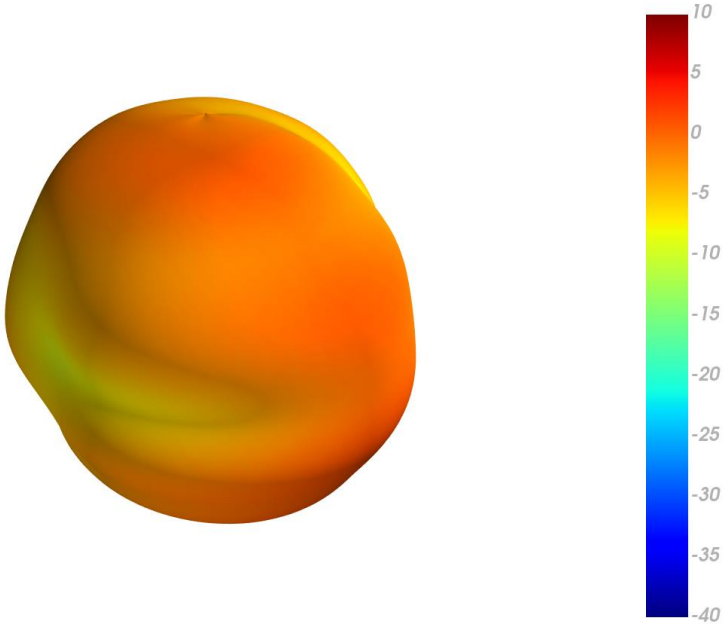
4. Radiation Patterns

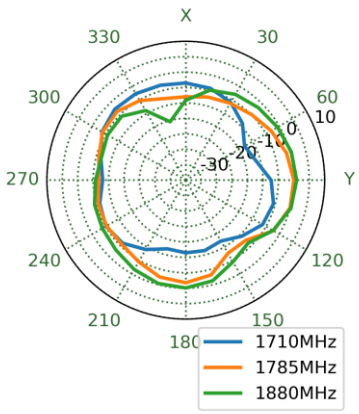
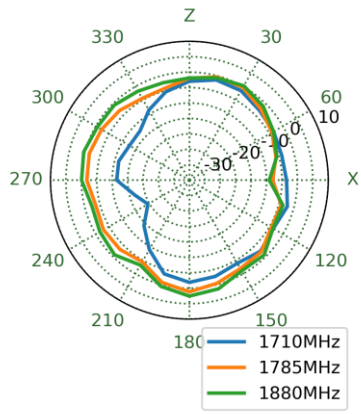
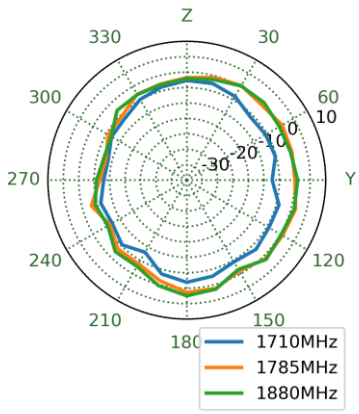
4.1 Test Setup



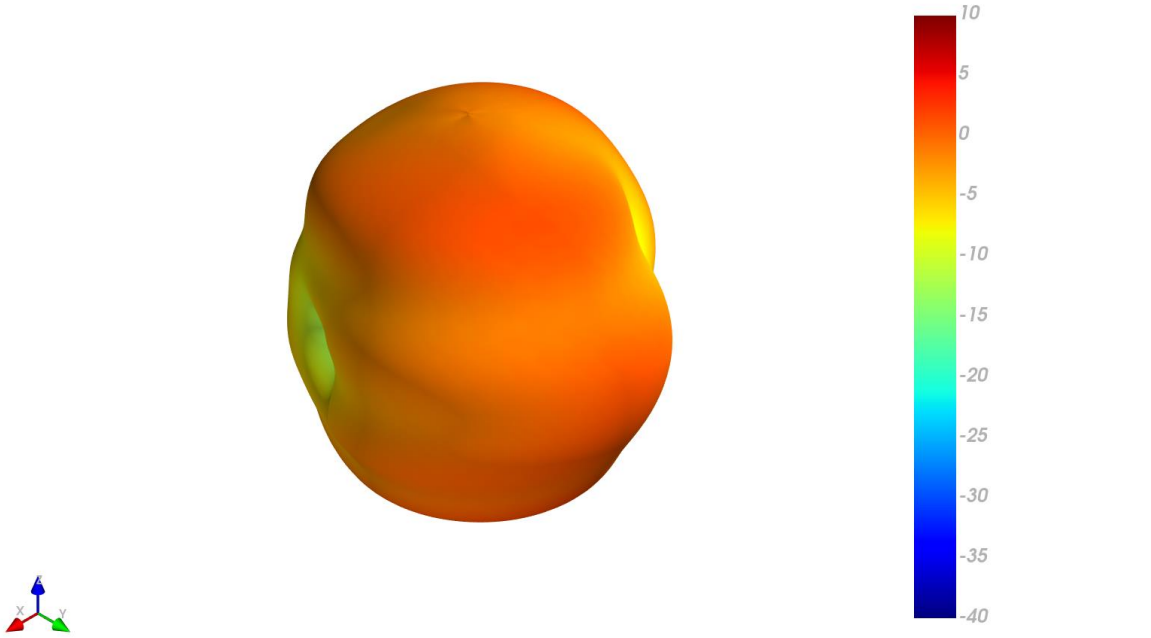
4.2 3D and 2D Radiation Patterns – MIMO 1

1785MHz

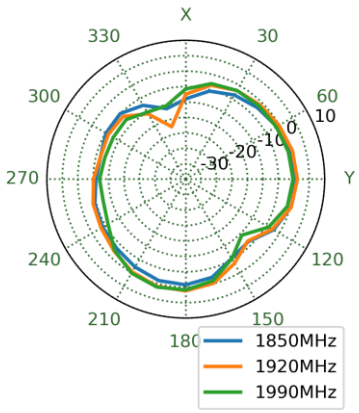


XY Plane	XZ Plane	YZ Plane
		

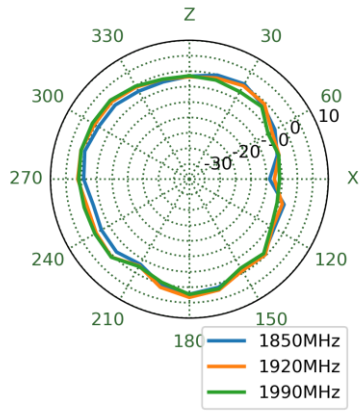
1920MHz



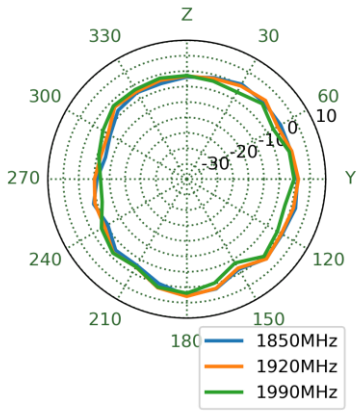
XY Plane



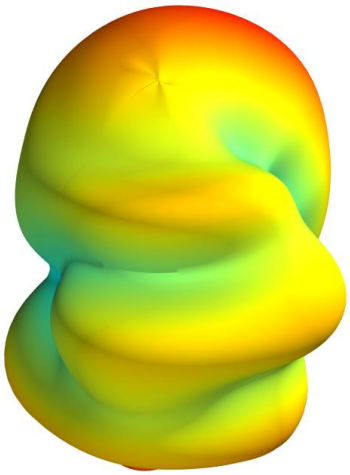
XZ Plane



YZ Plane



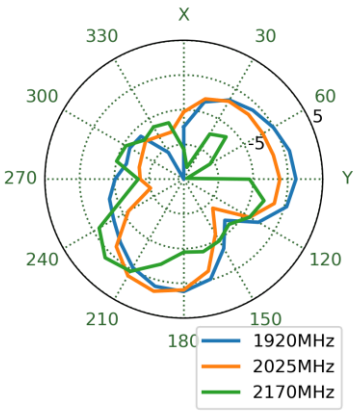
2025MHz

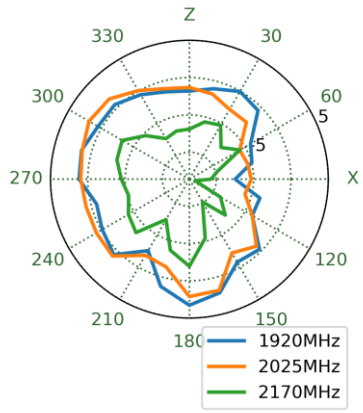


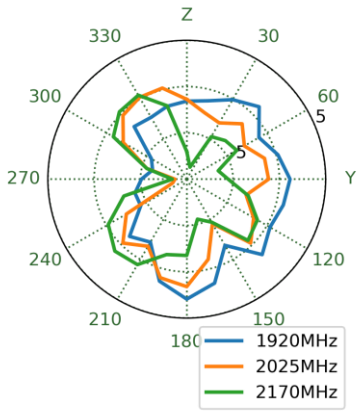




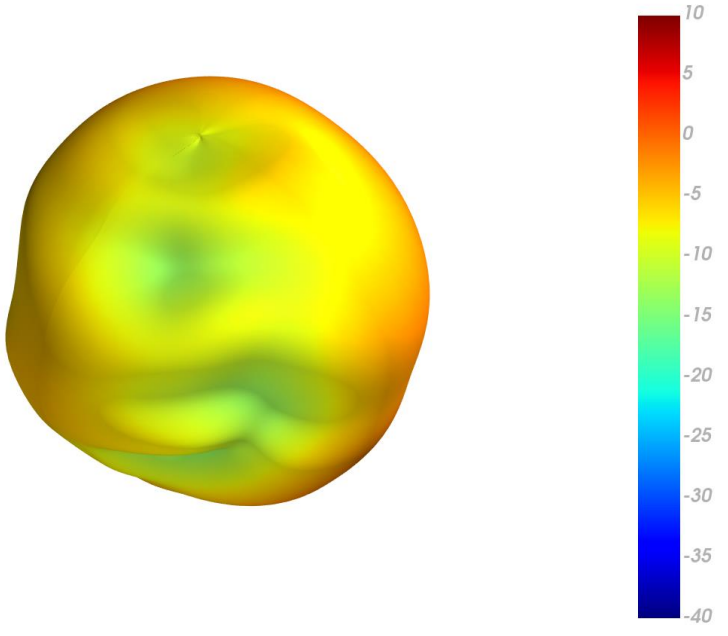
XY Plane	XZ Plane	YZ Plane



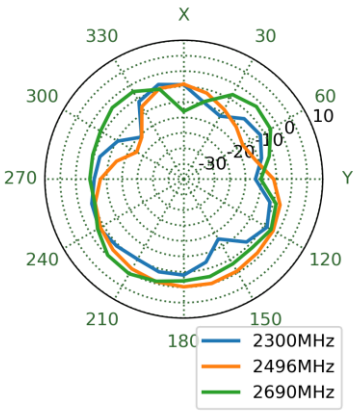


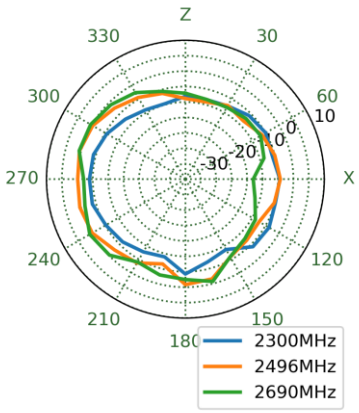


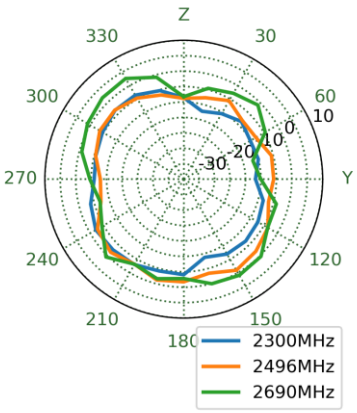
2496MHz



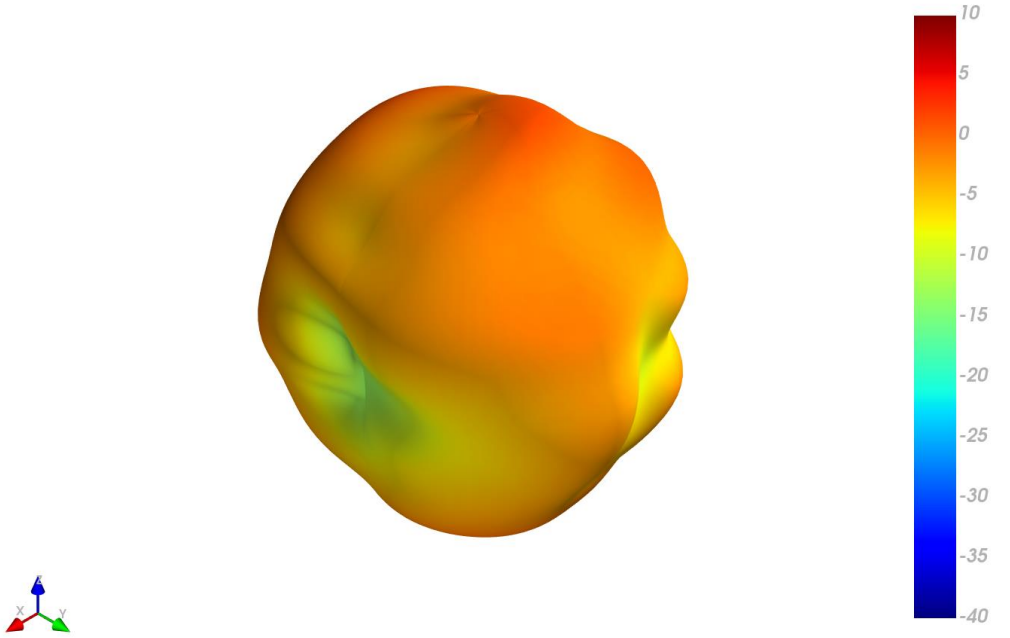
XY Plane	XZ Plane	YZ Plane



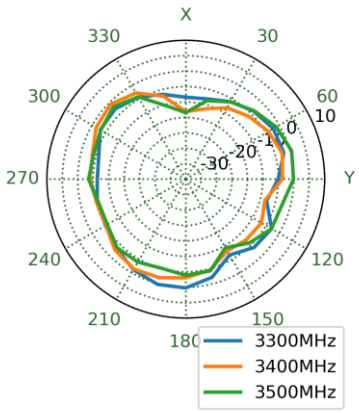


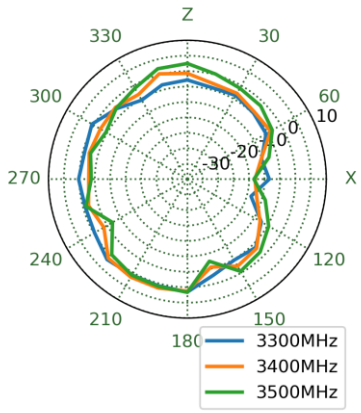


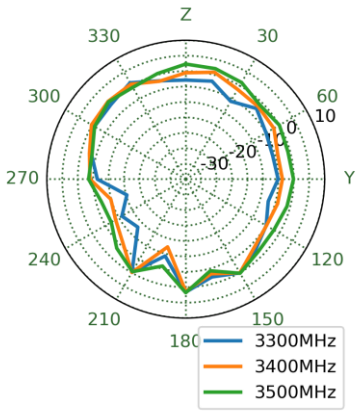
3400MHz



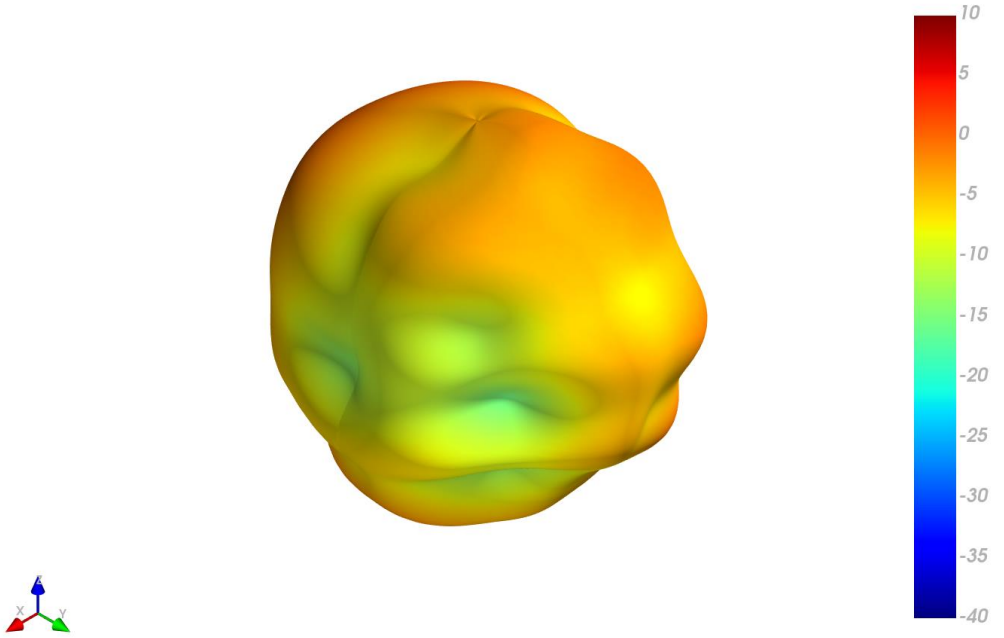
XY Plane	XZ Plane	YZ Plane



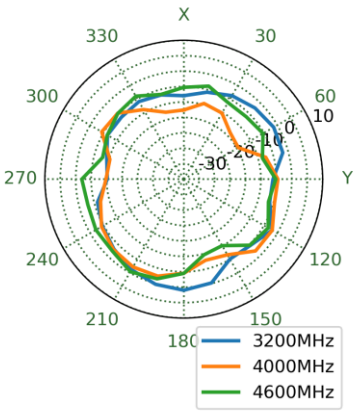




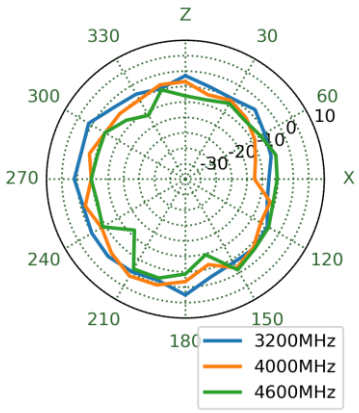
4000MHz



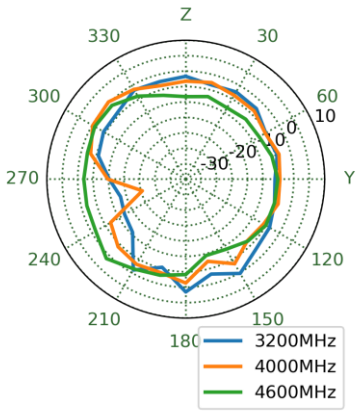
XY Plane



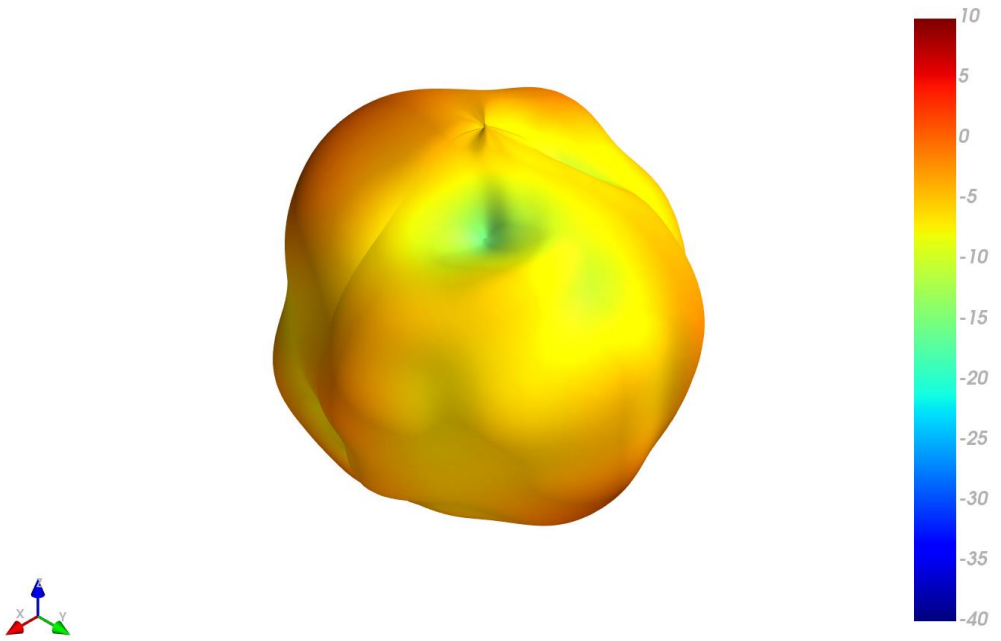
XZ Plane



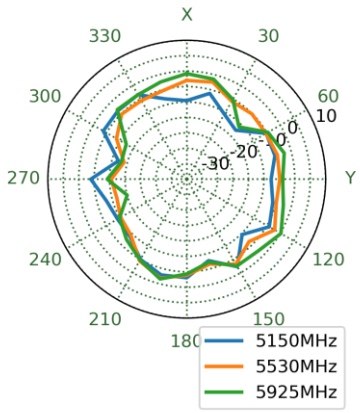
YZ Plane

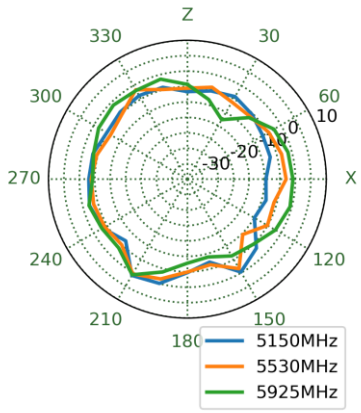


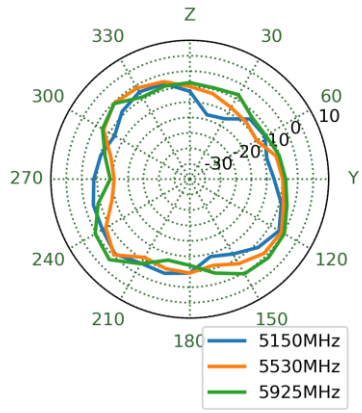
5530MHz



XY Plane	XZ Plane	YZ Plane

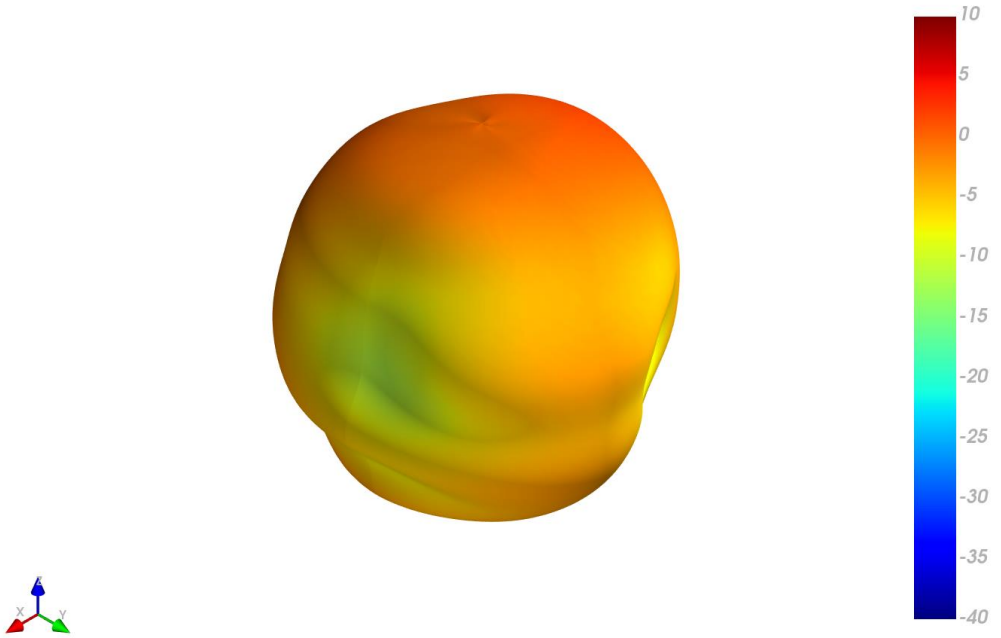




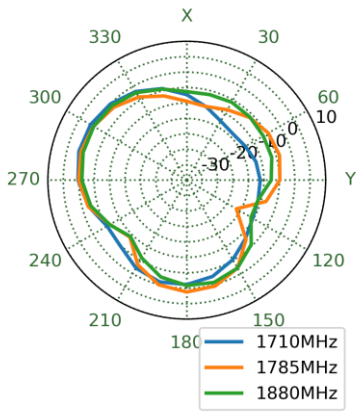


4.3 3D and 2D Radiation Patterns – MIMO 2

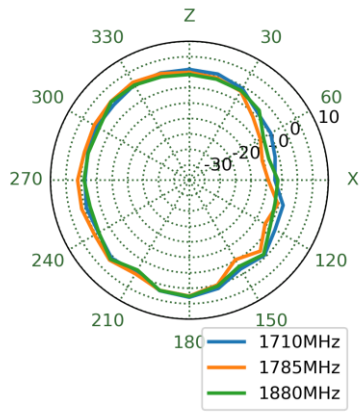
1785MHz



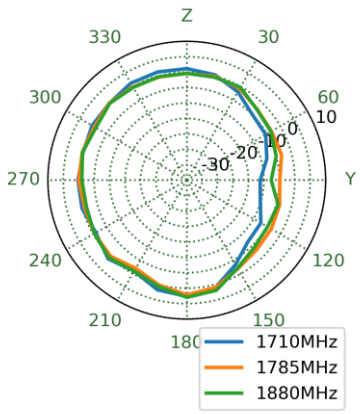
XY Plane



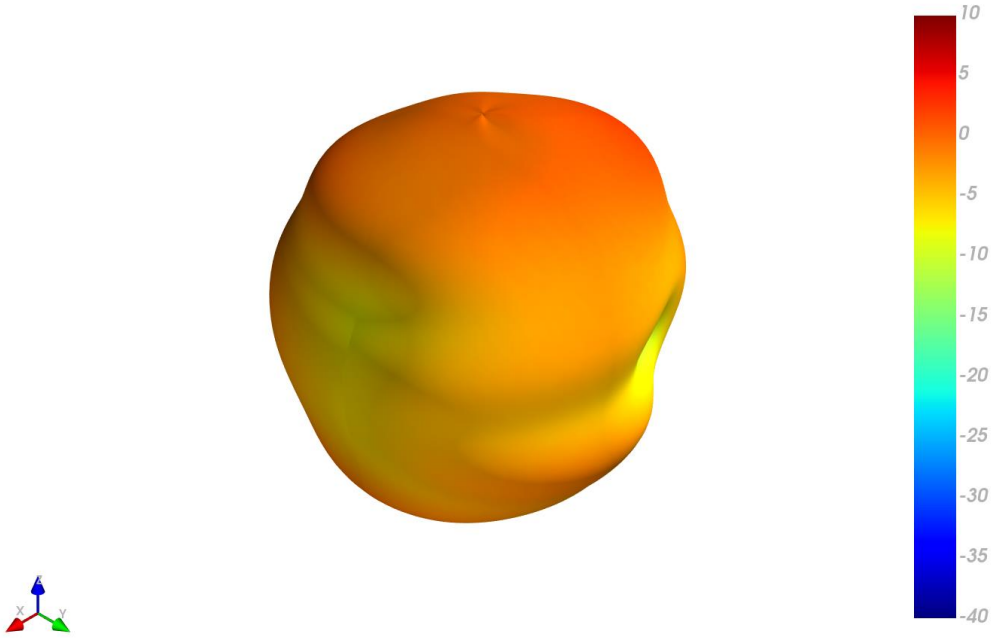
XZ Plane



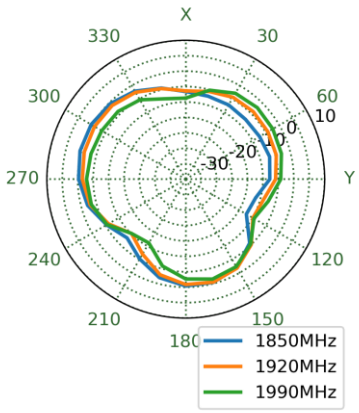
YZ Plane

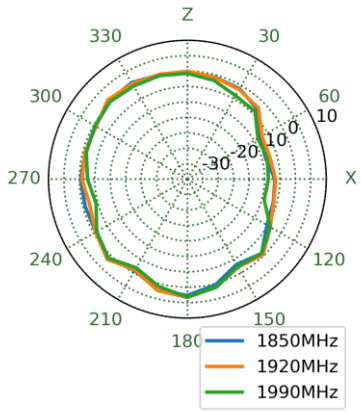


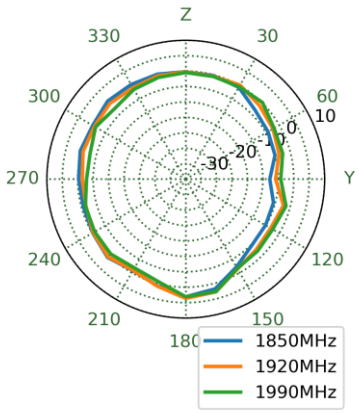
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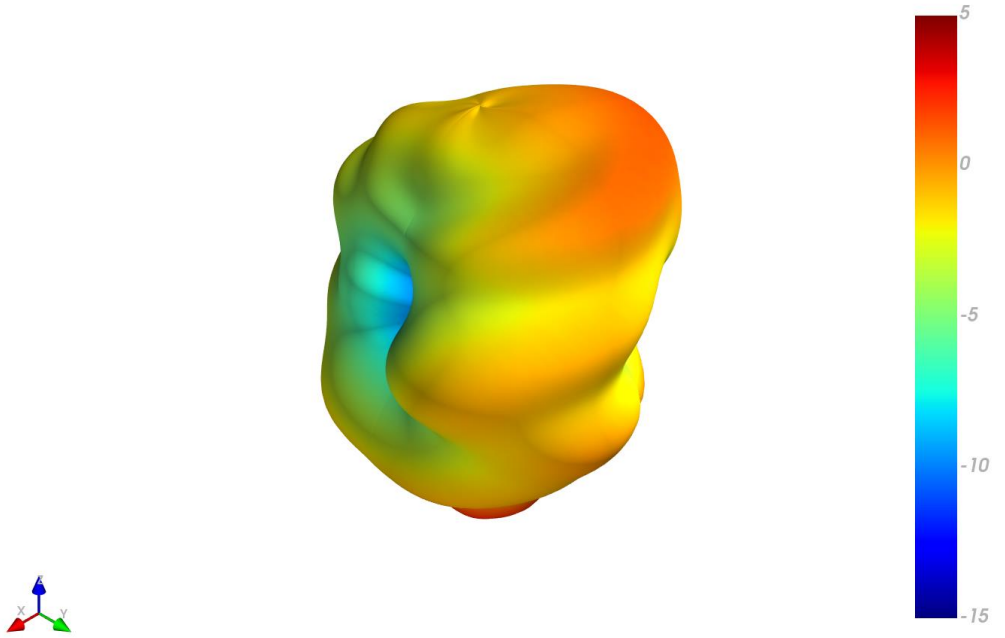
XY Plane	XZ Plane	YZ Plane



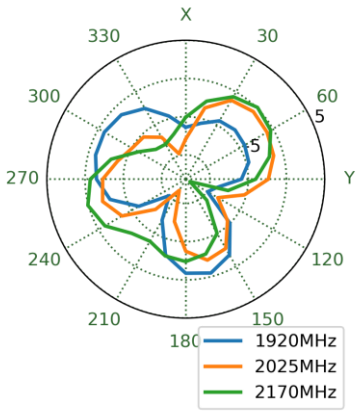


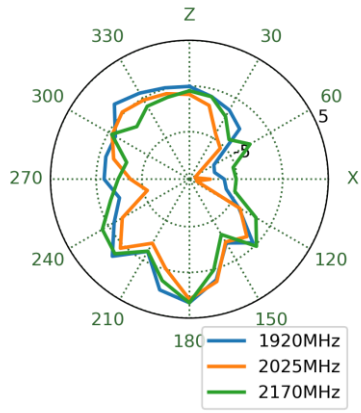


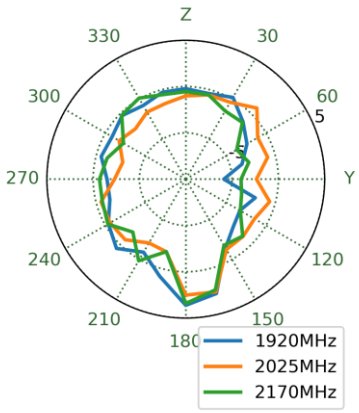
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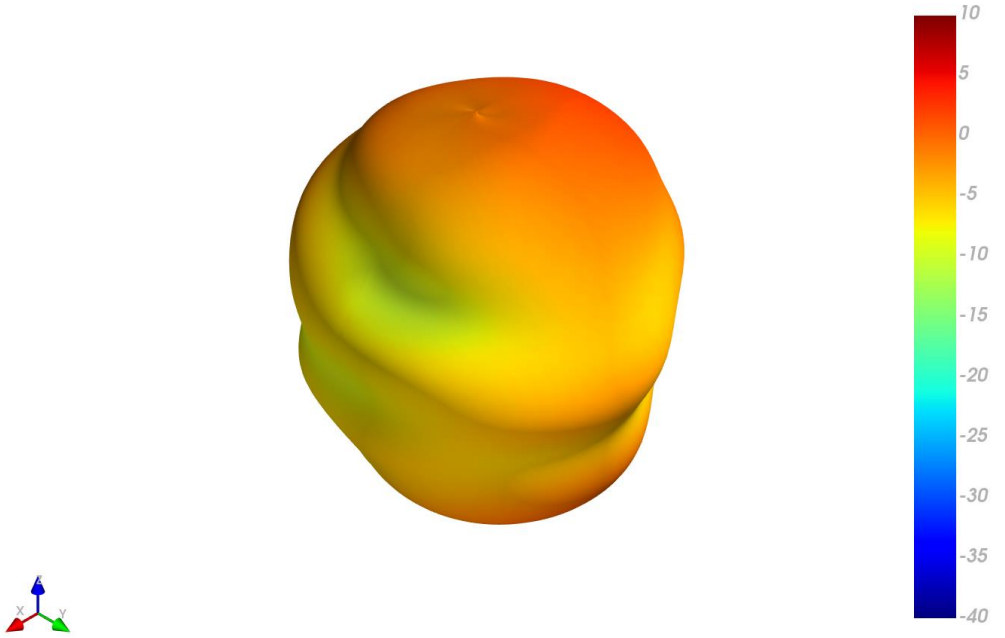
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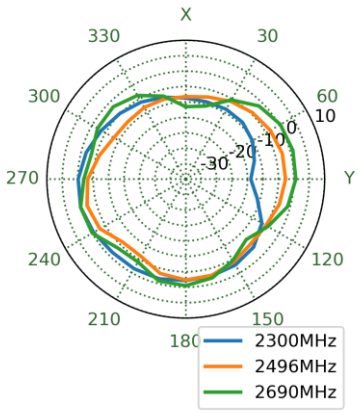
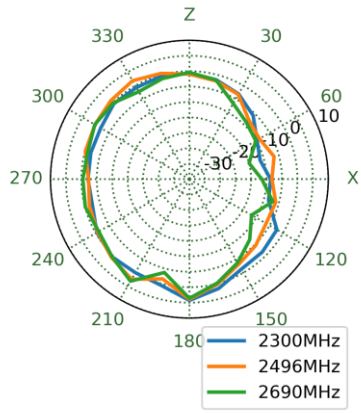
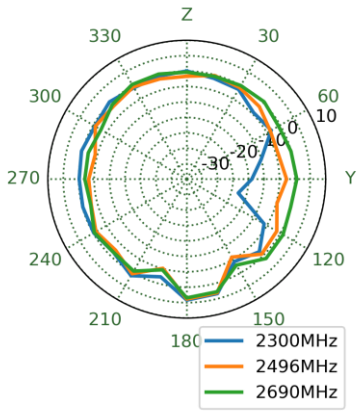




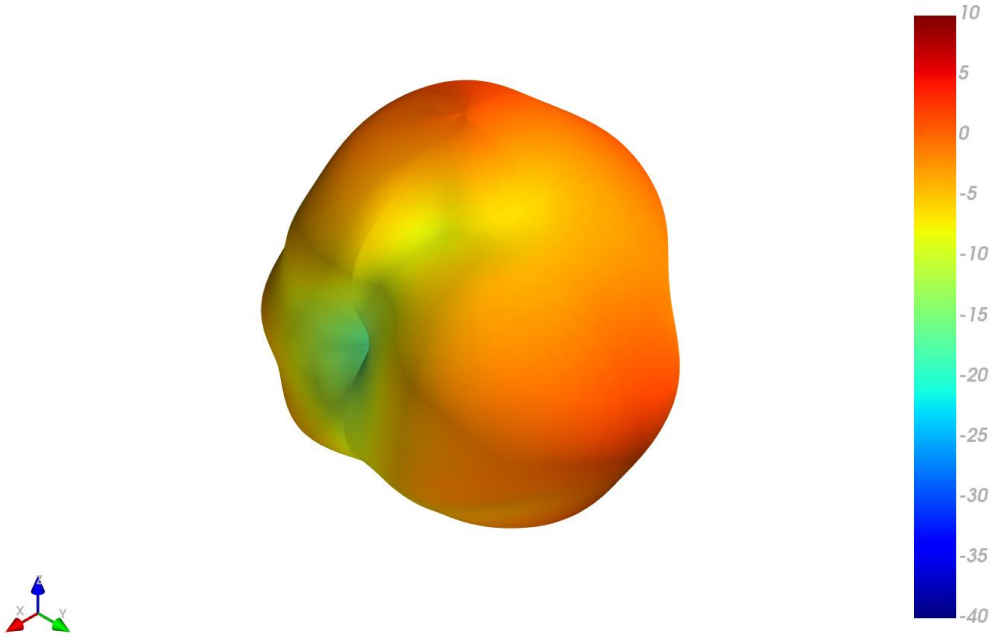


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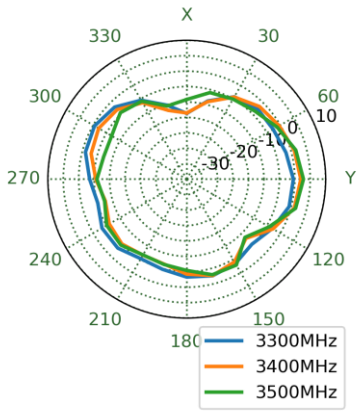


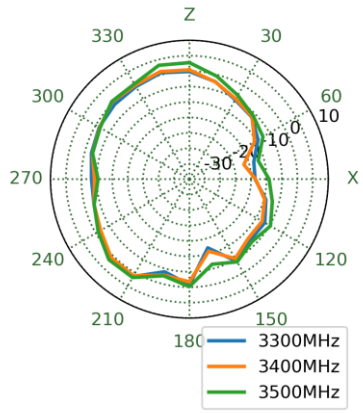
XY Plane	XZ Plane	YZ Plane
		

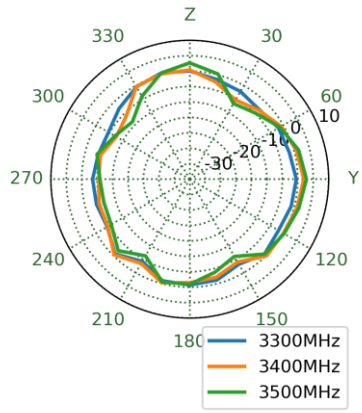
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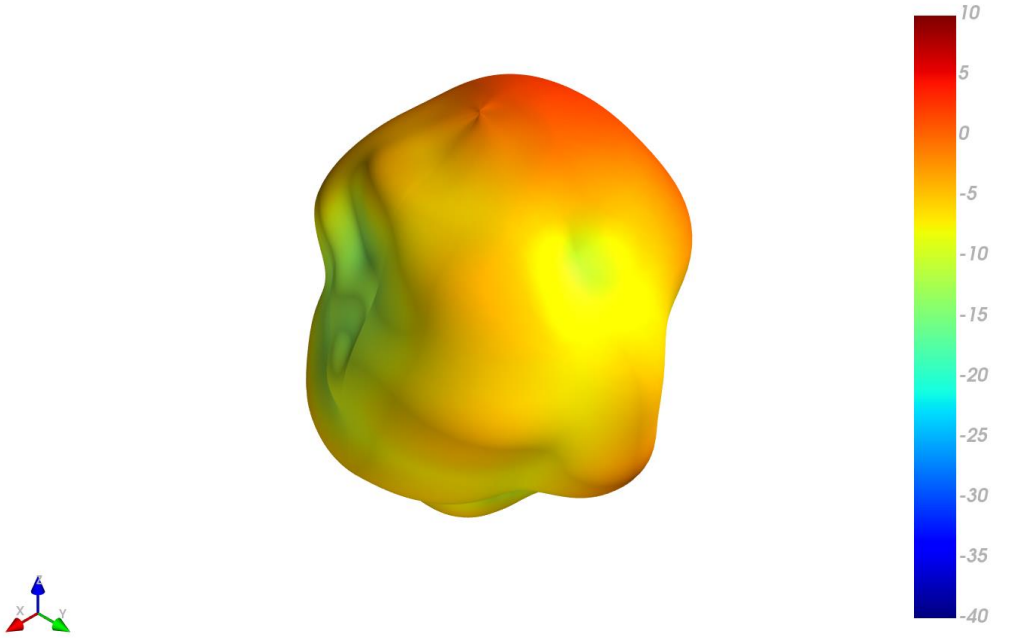
XY Plane	XZ Plane	YZ Plane



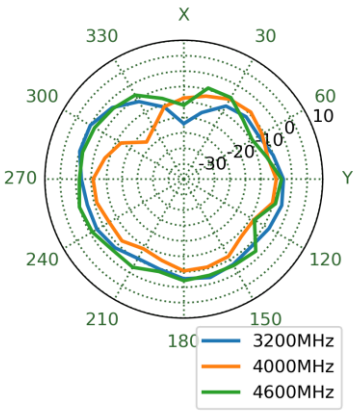




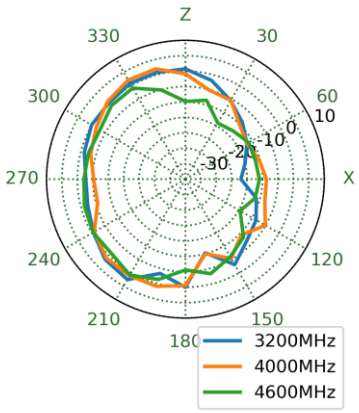
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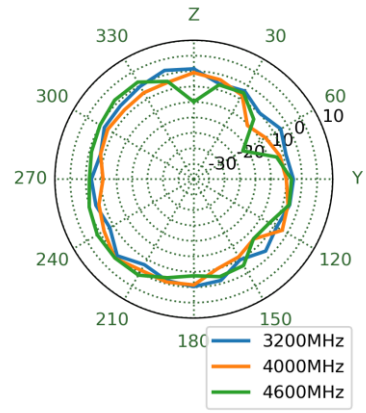
XY Plane



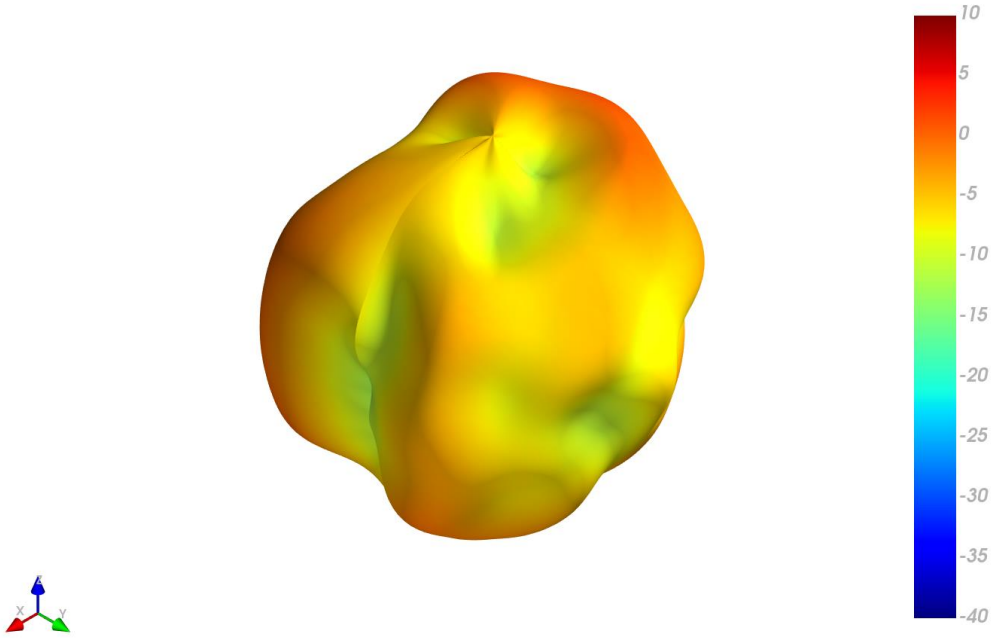
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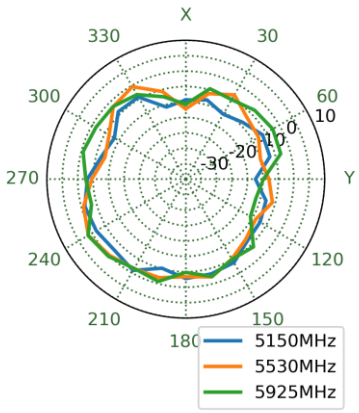
YZ Plane

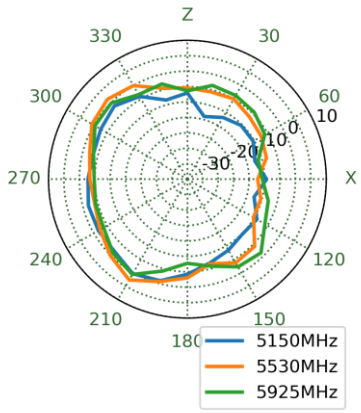


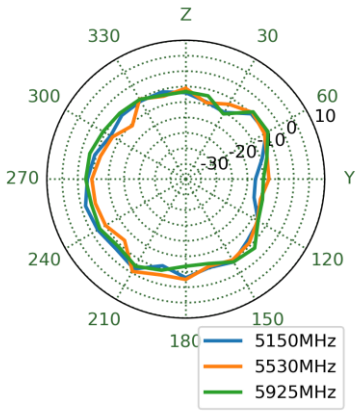
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XY Plane	XZ Plane	YZ Plane

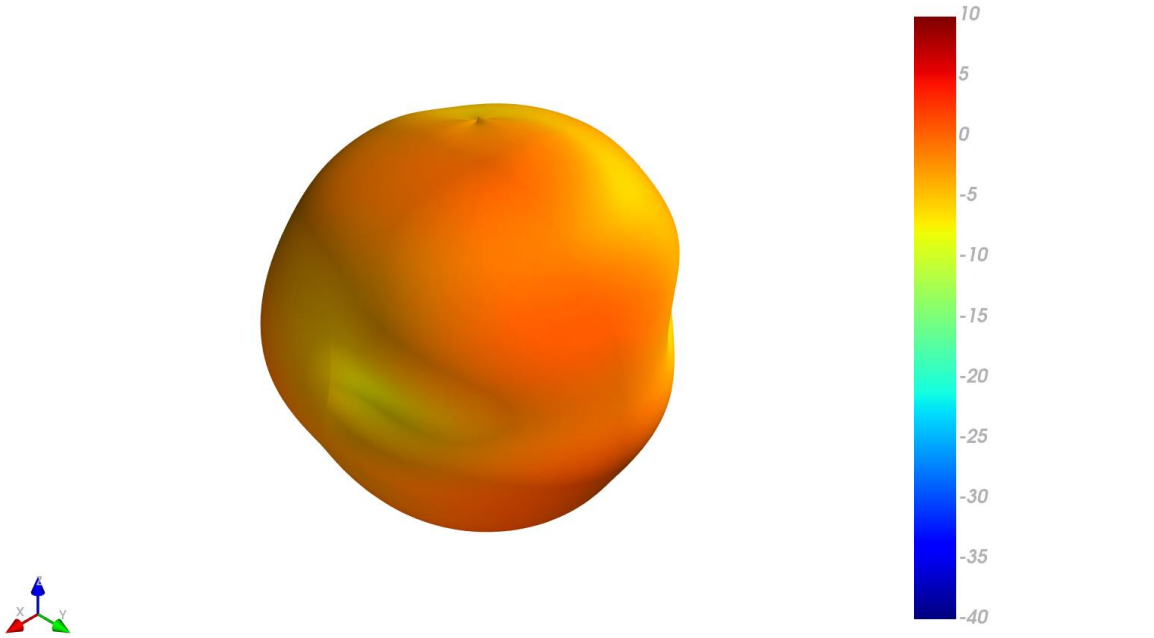




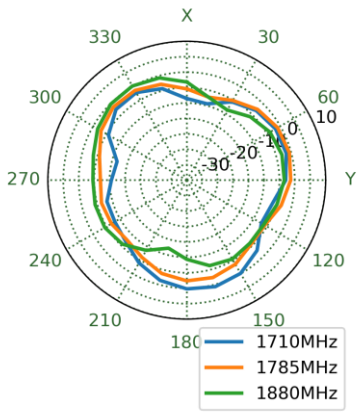


4.4 3D and 2D Radiation Patterns – MIMO 3

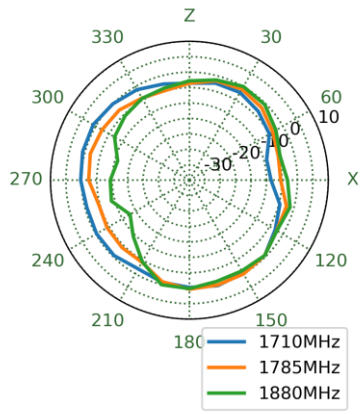
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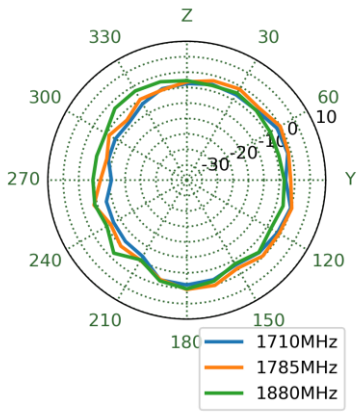
XY Plane



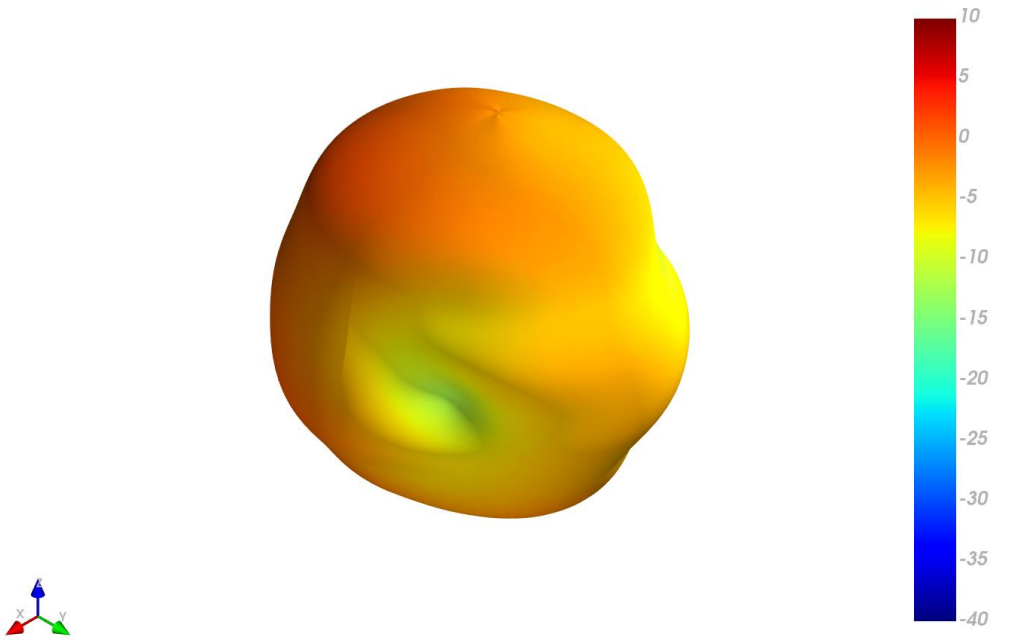
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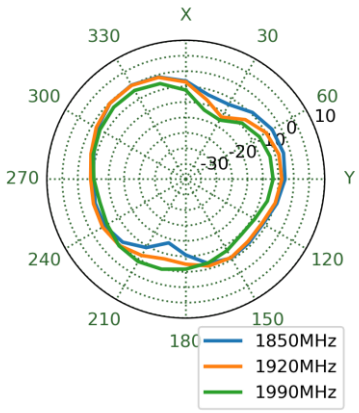
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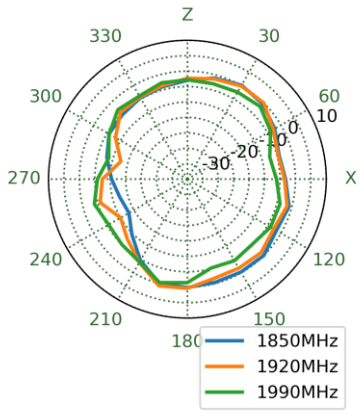


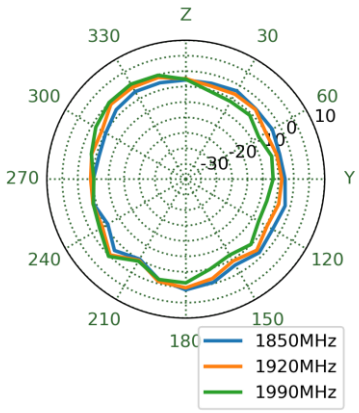
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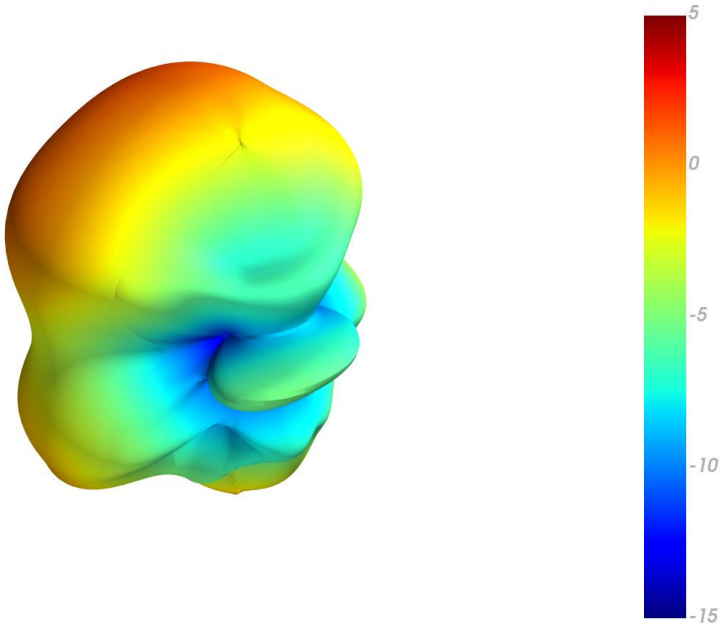
XY Plane	XZ Plane	YZ Plane



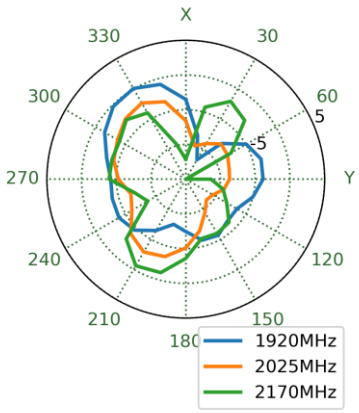




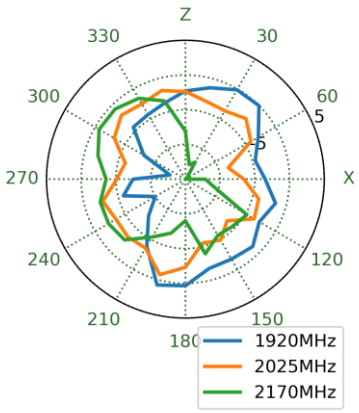
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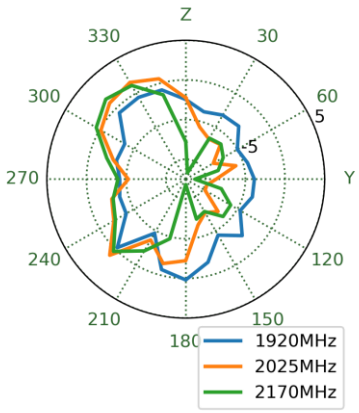
XY Plane



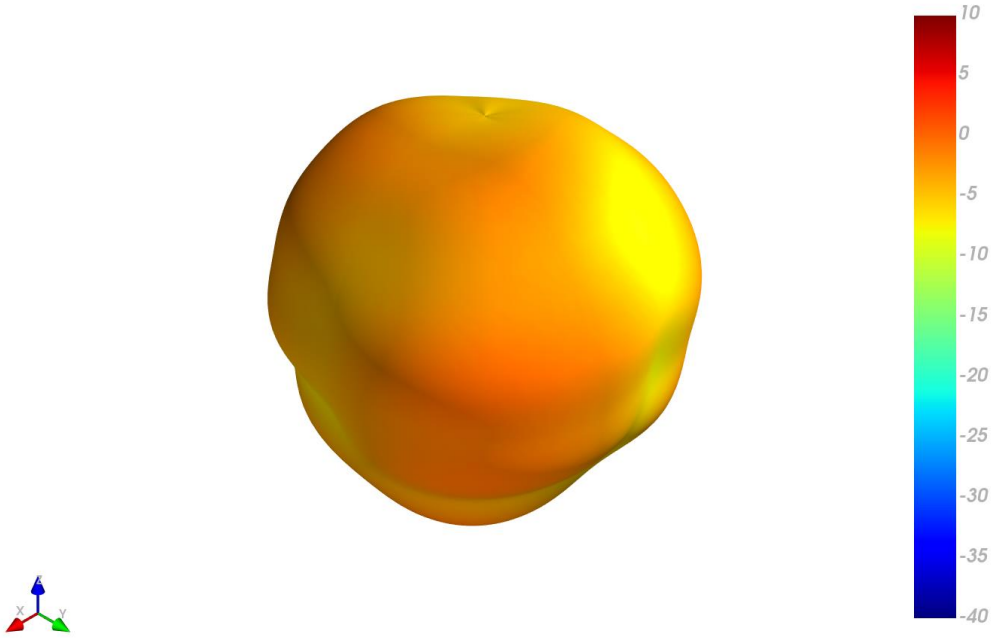
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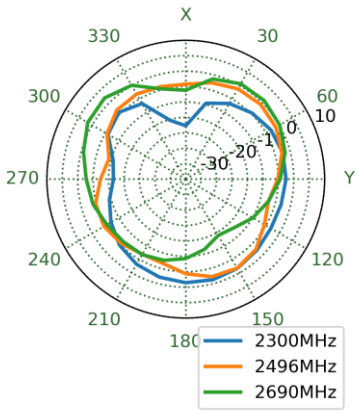
YZ Plane

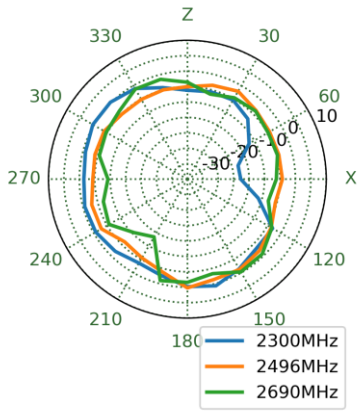


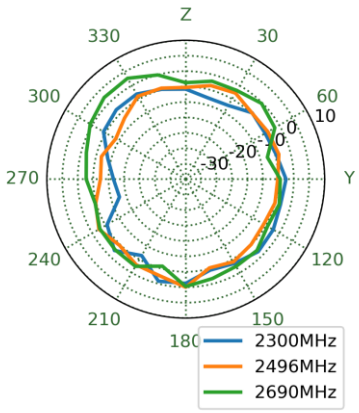
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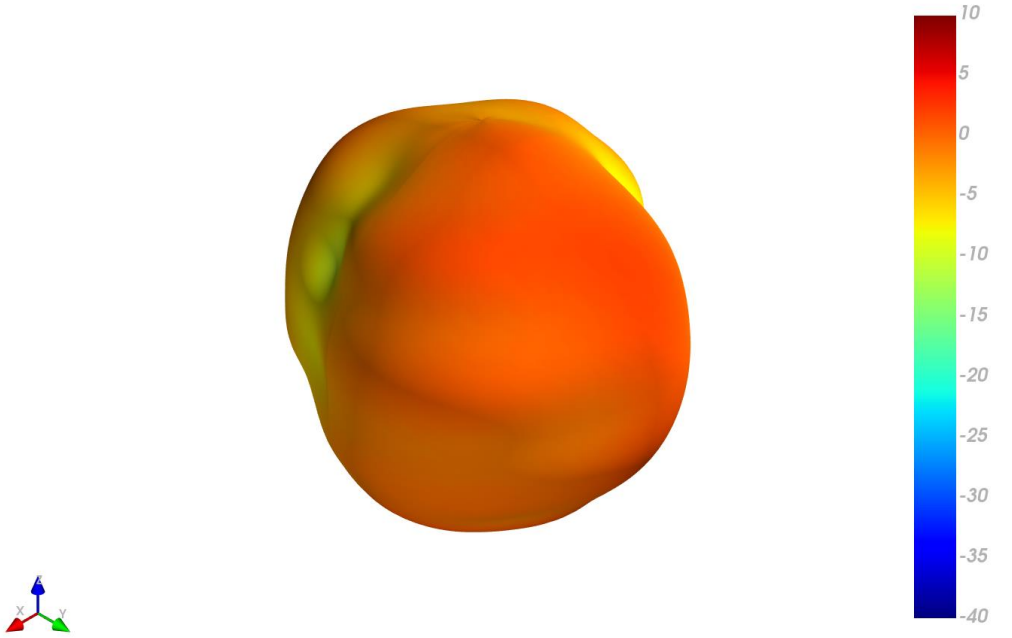
XY Plane	XZ Plane	YZ Plane



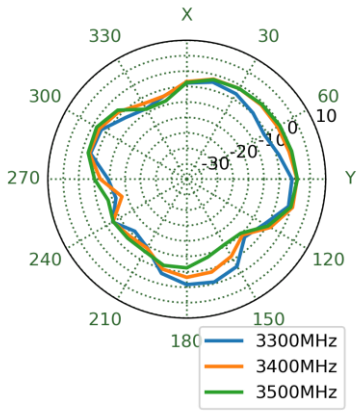


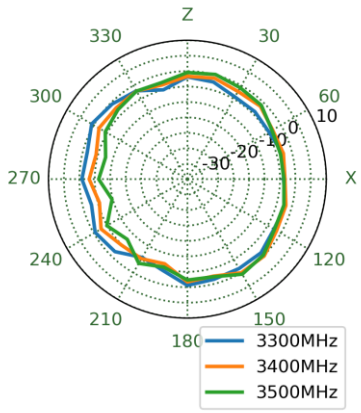


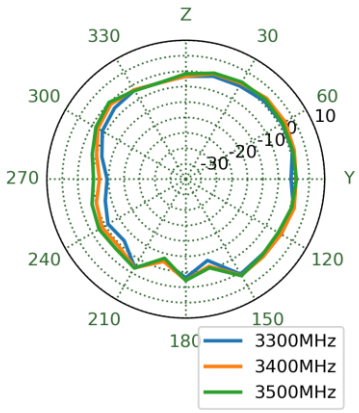
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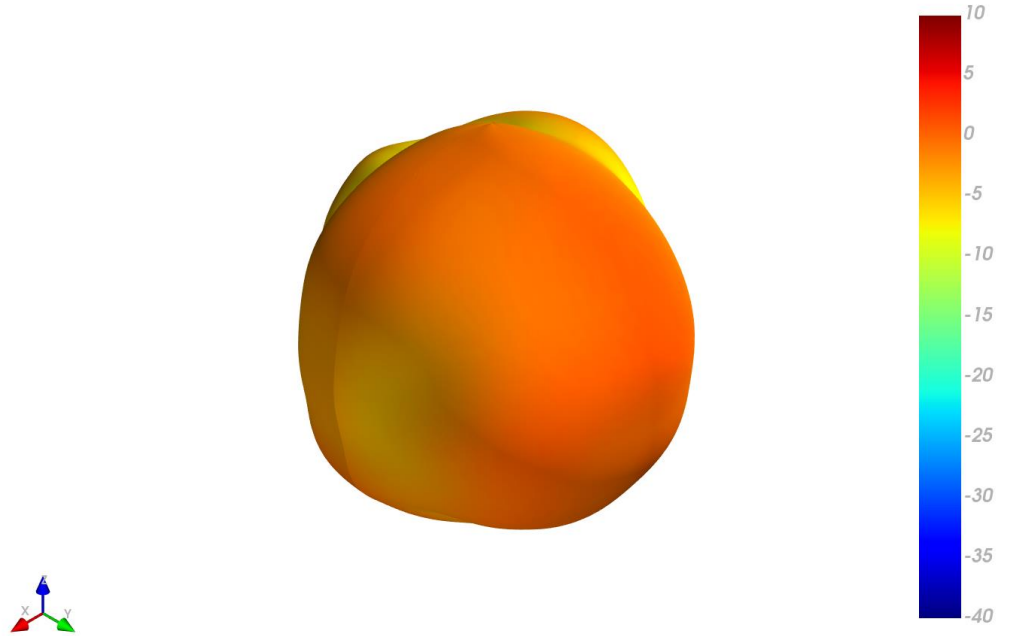
XY Plane	XZ Plane	YZ Plane



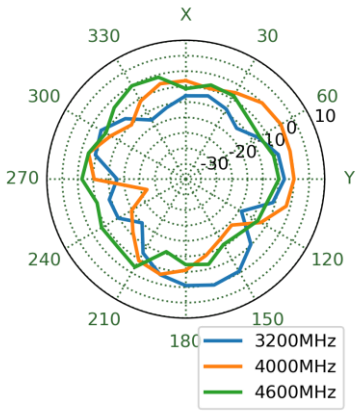




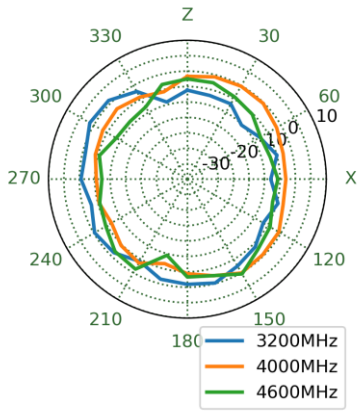
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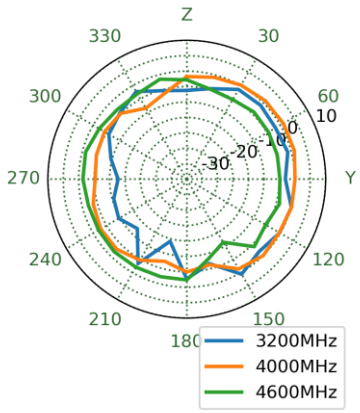
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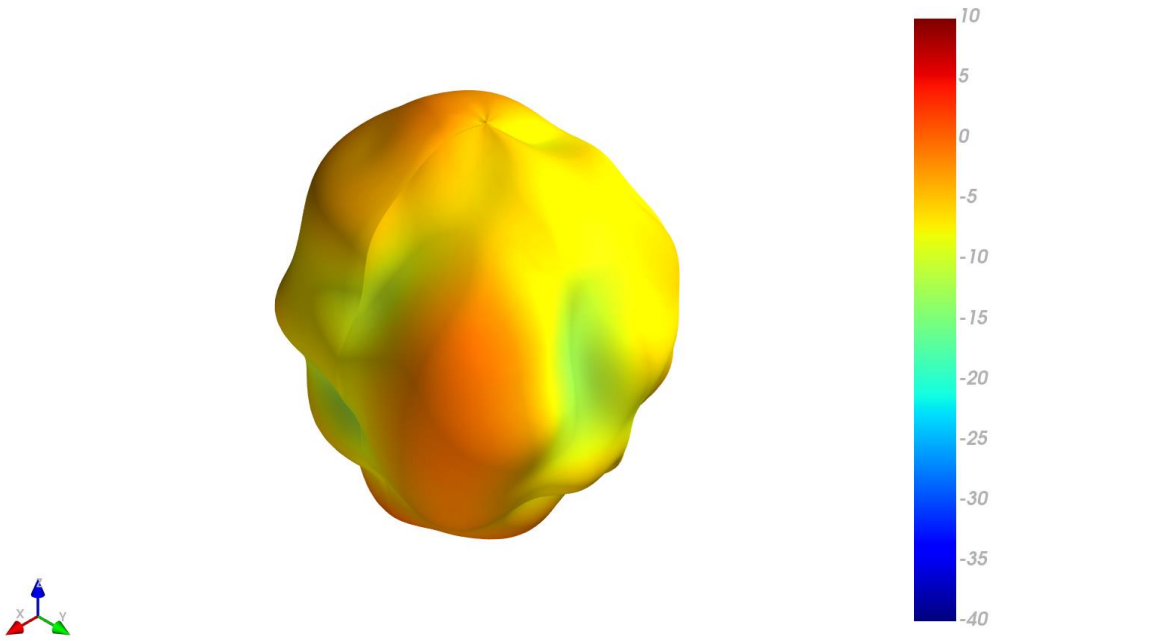
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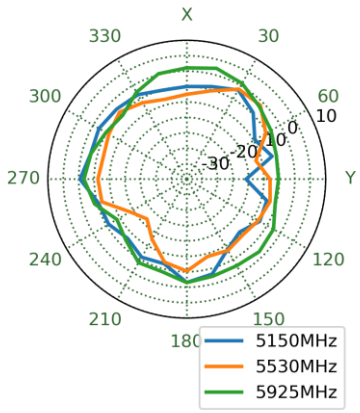
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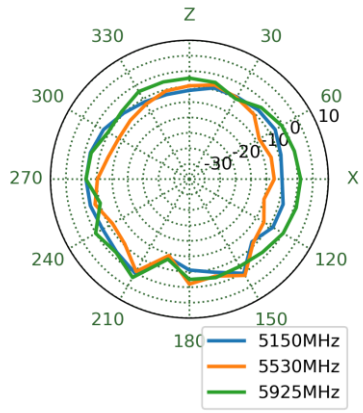


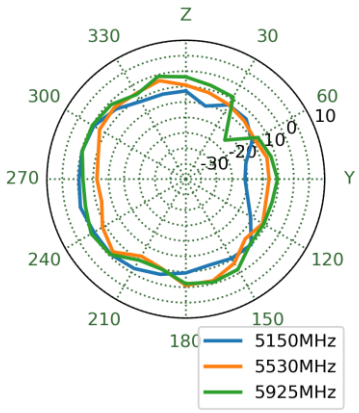
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XY Plane	XZ Plane	YZ Plane

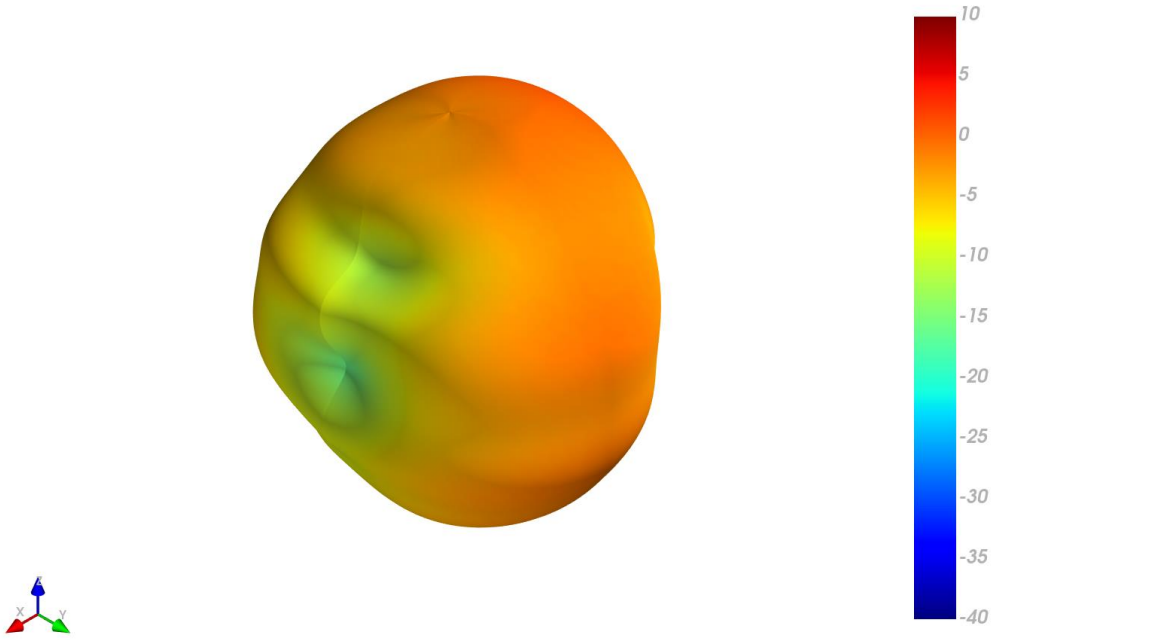




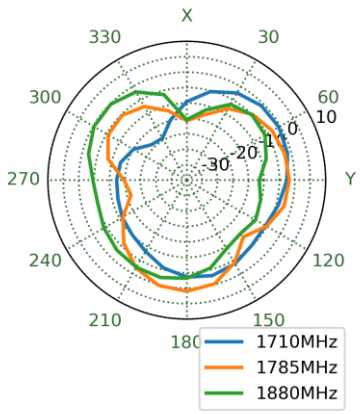


4.5 3D and 2D Radiation Patterns – MIMO 4

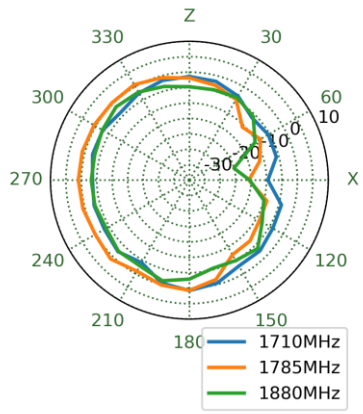
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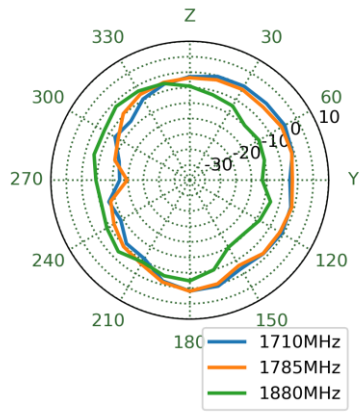
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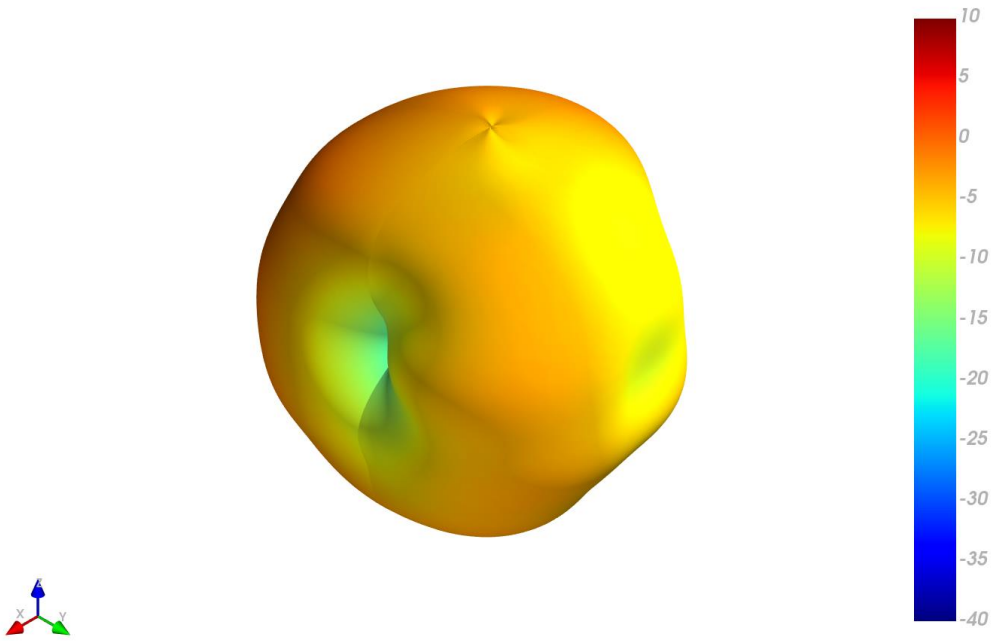
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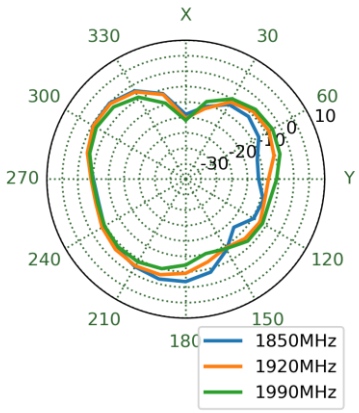
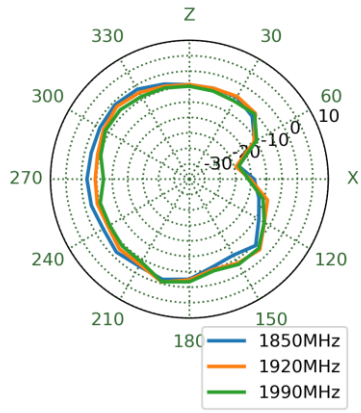
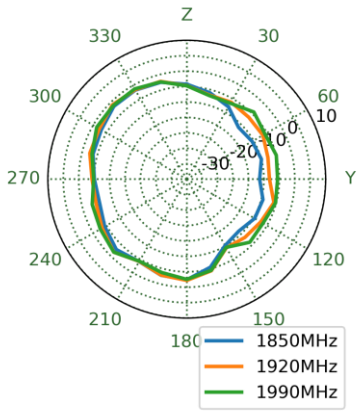


YZ Plane

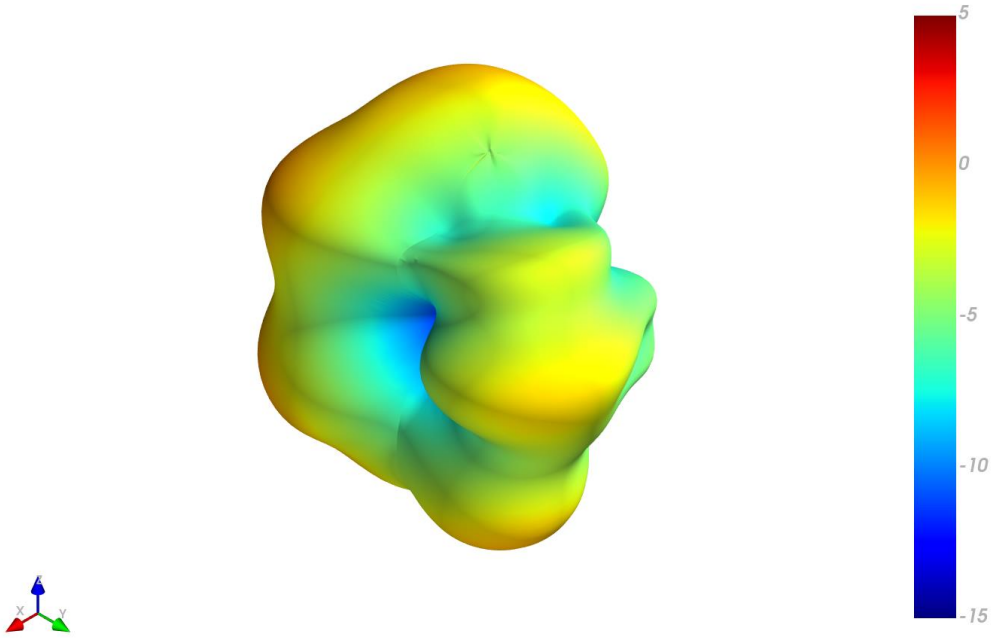


1920MHz

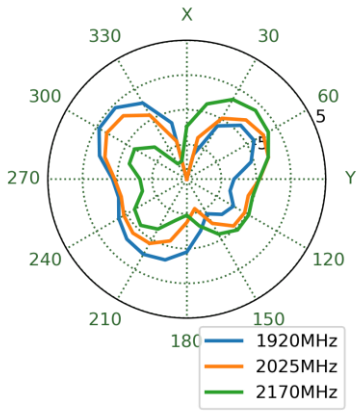


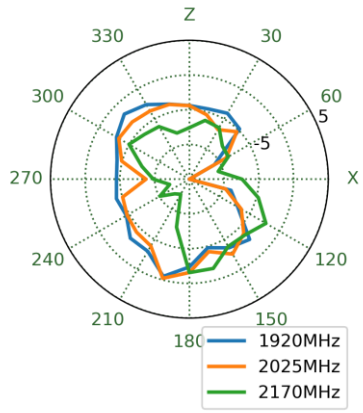
XY Plane	XZ Plane	YZ Plane
		

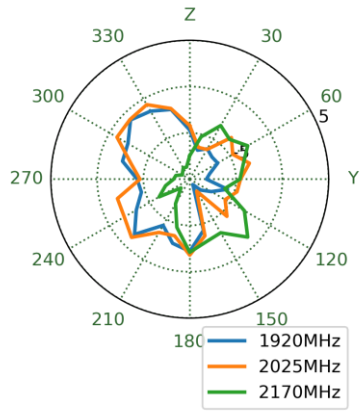
2025MHz



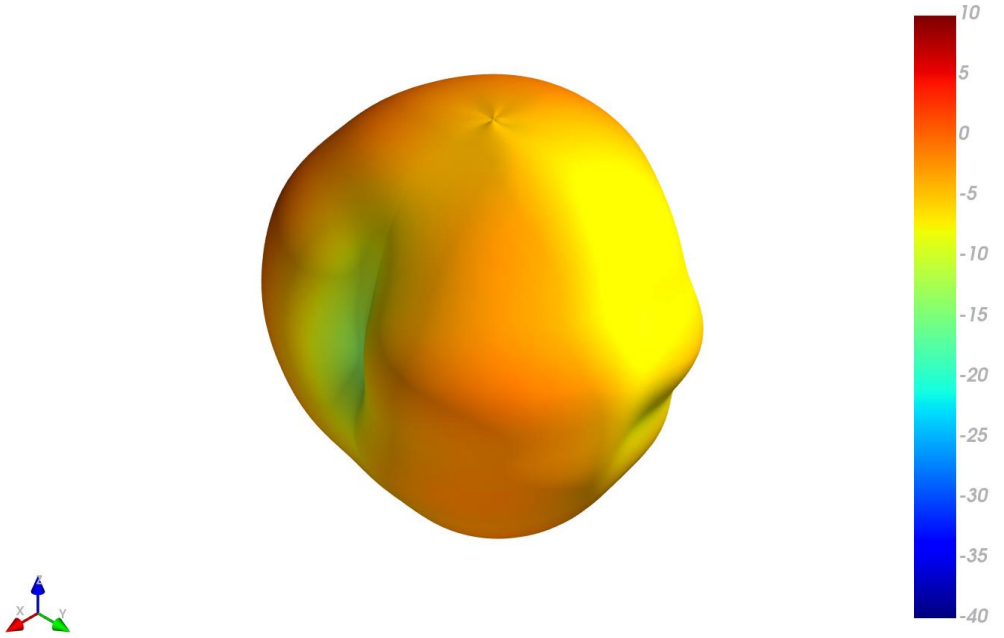
XY Plane	XZ Plane	YZ Plane



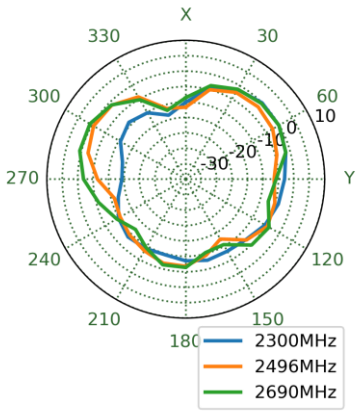




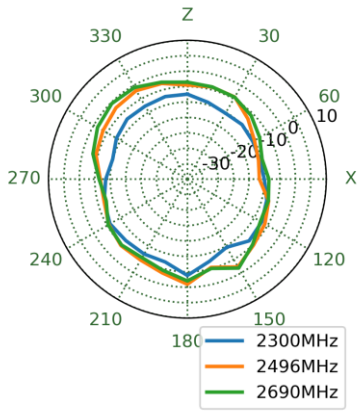
2496MHz



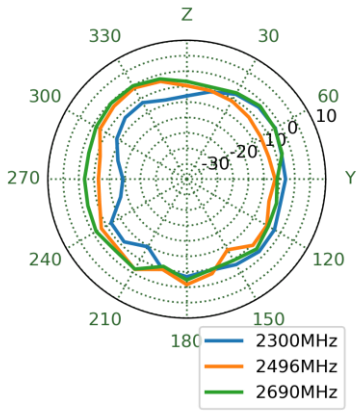
XY Plane



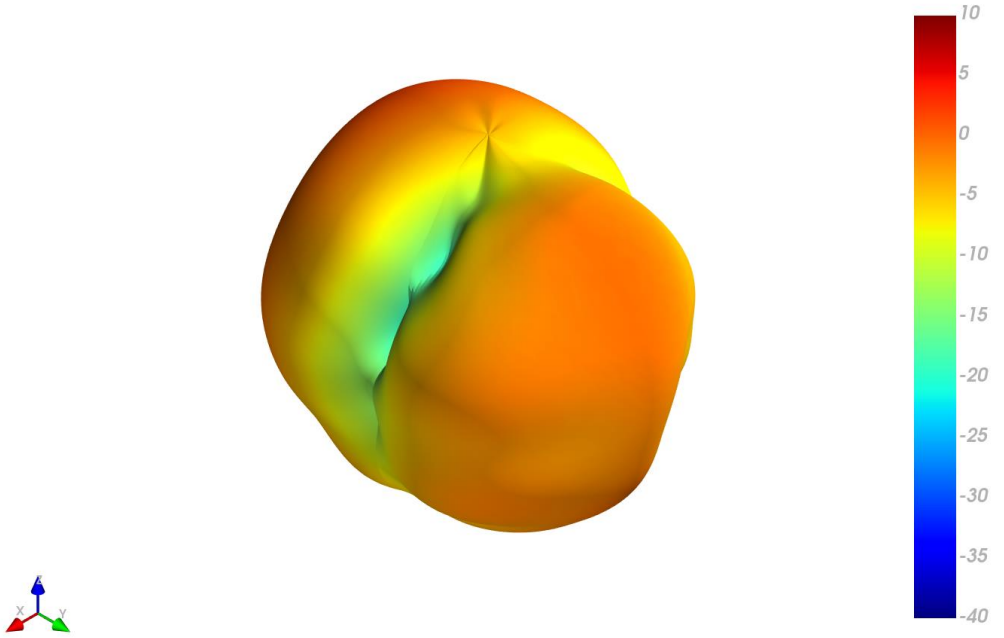
XZ Plane



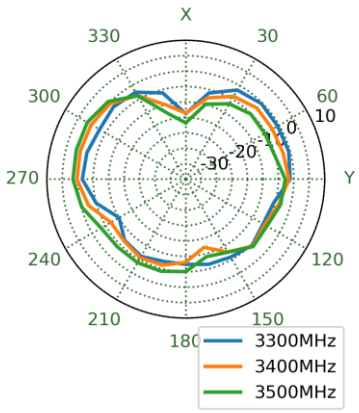
YZ Plane

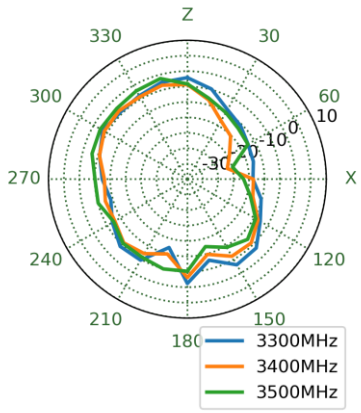


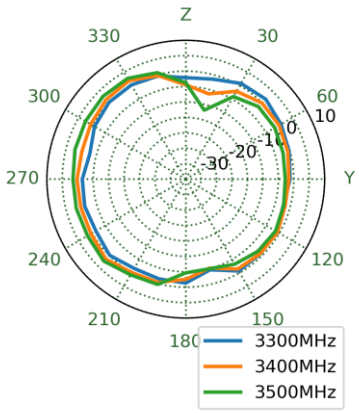
3400MHz



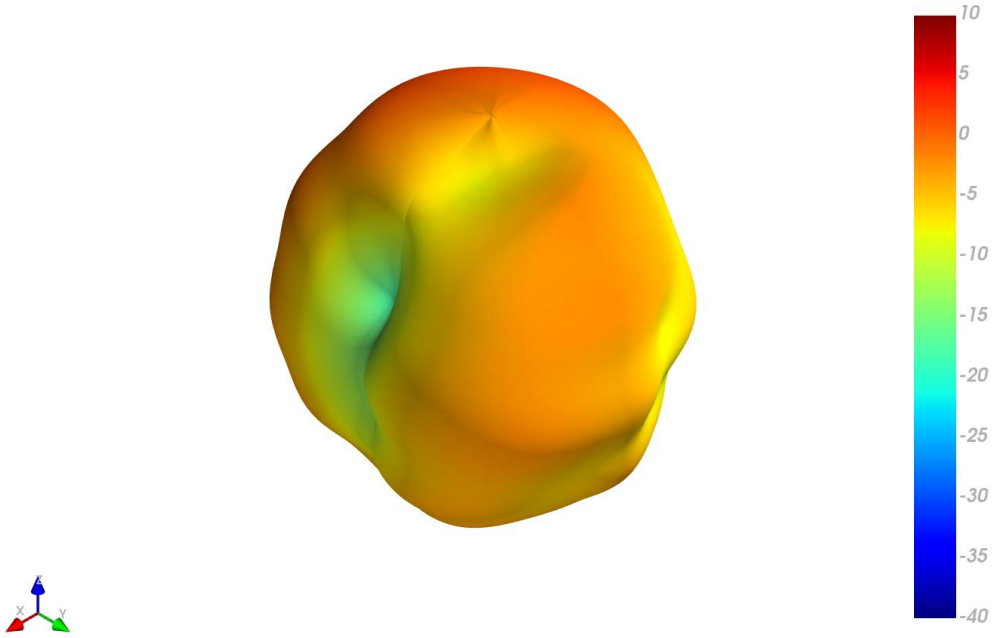
XY Plane	XZ Plane	YZ Plane



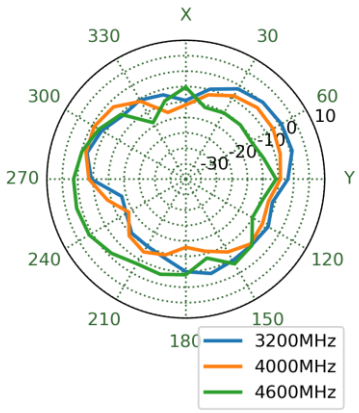


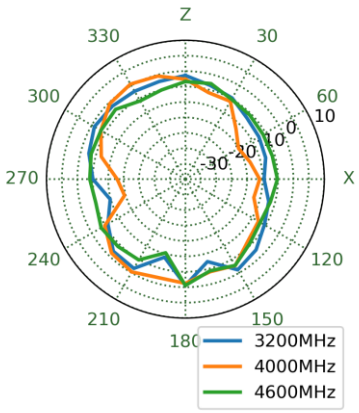


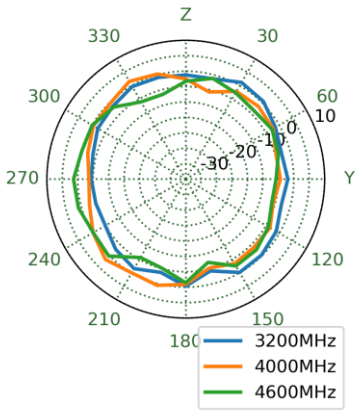
4000MHz



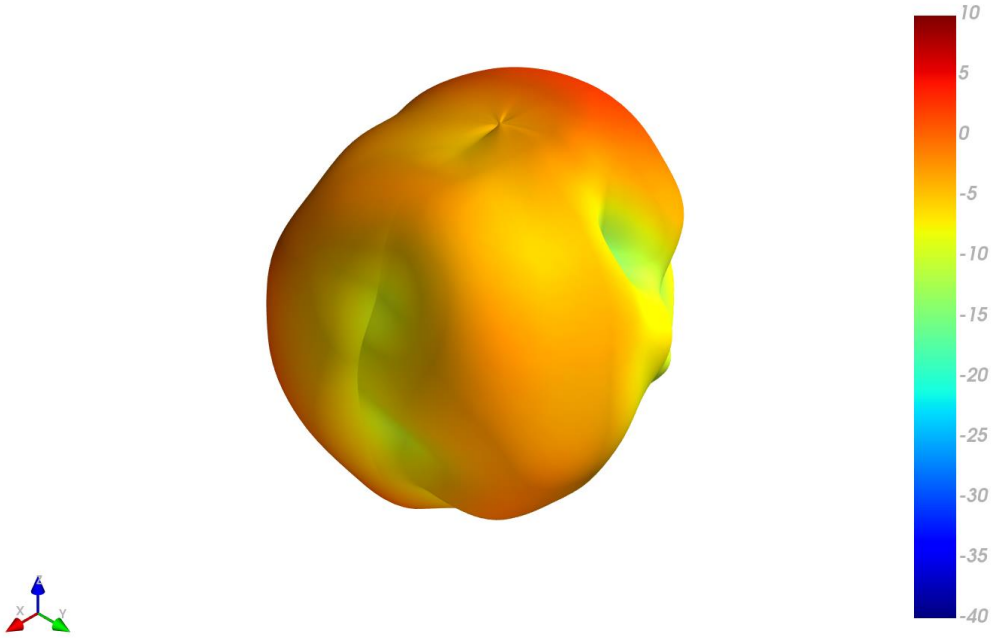
XY Plane	XZ Plane	YZ Plane



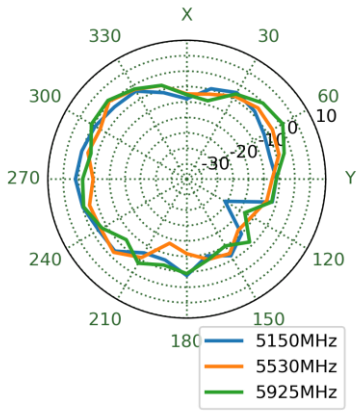


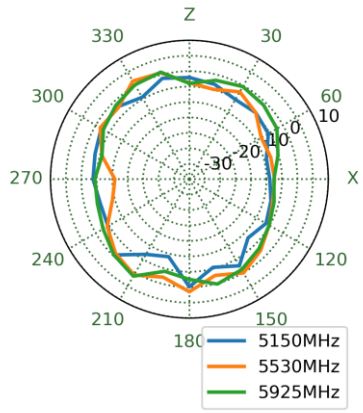


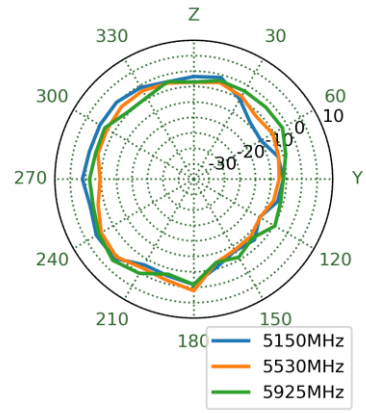
5530MHz



XY Plane	XZ Plane	YZ Plane



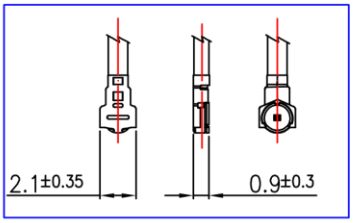




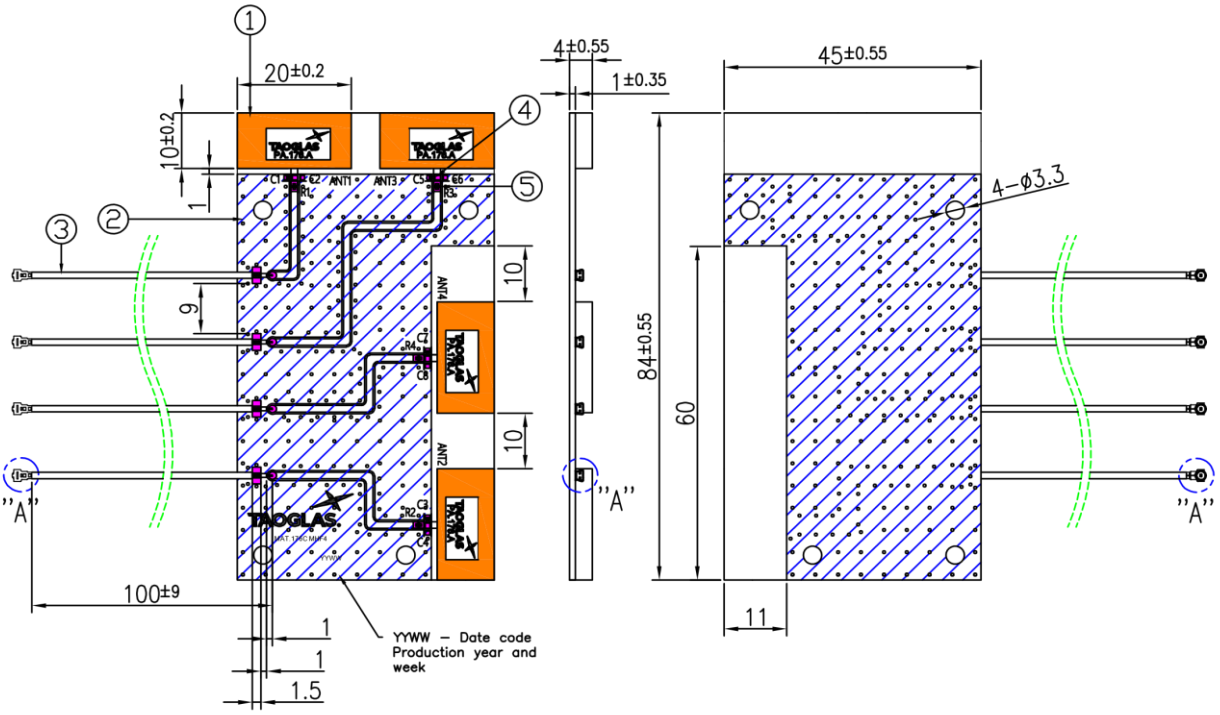
5. Mechanical Drawing (Units: mm)

ISO NO.: EDW-21-8-0343
STATE: Release
NOTES: 1. Slodered area
2. Copper area
3. Logo & Text Ink Printing : White

REV.	DESCRIPTION	ENG.	APPROVED	DATE
D01	Initial Design	Mickey	Buluto	2021/02/23



Detail A
Scale:1:3



	Name	Material	Finish	QTY
1	PA.176.A Antenna	Ceramic	White	4
2	MAT.176C PCB	Composite 1.0t	Black	1
3	1.13 Coaxial Cable to IPEX MHF4	AU Plated	Black	4
4	L=5.6 nH Inductor (0402)	Ceramic	N/A	4
5	Thick Film Res. (0402/00)	Ceramic	N/A	4

APPROVED BY:	Buluto
CHECK BY:	Adam
DRAWN BY:	Mickey
DATE:	2021/02/23
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

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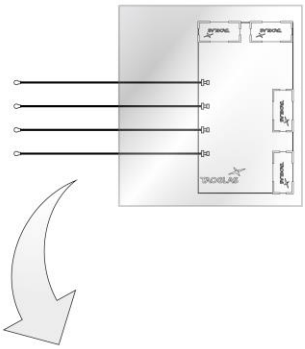
TITLE : 4-in-1 5G Multi-Antenna Board (84x45mm) antennas with 4x 100mm 1.13 Cables & MHF4 Connectors

PART NO. : MAT.176C

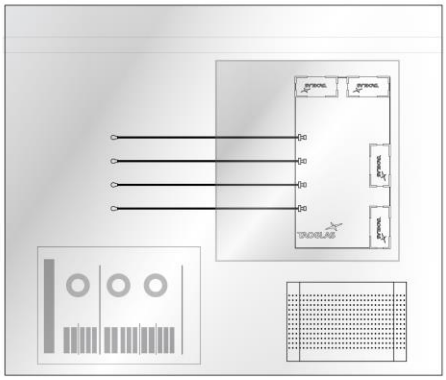
UNIT:	SCALE:	PAGES:	REV.
mm	1:1.15	1/1	D01

6. Packaging

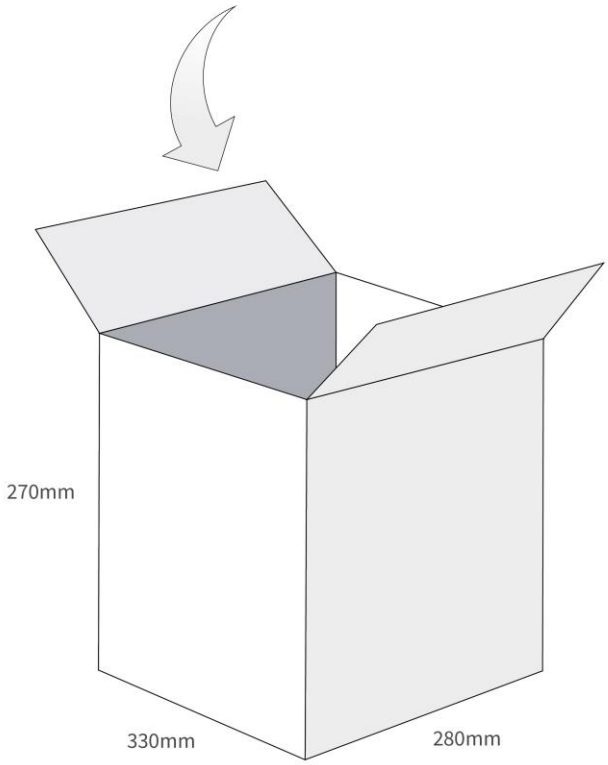
1 pc MAT.176C
per Bubble bag
Weight - 40g



1 pc MAT.176C
1 pc Humidity Indicator Card
1 pc Silica Gel Dessicant
per sealed PE Bag



30 pcs MAT.176C per Carton
Carton Dimensions - 330 x 280 x 270mm
Weight - 1.2Kg



Changelog for the datasheet

SPE-21-8-059 – MAT.176C

Revision: A (Original First Release)	
Date:	2021-08-13
Notes:	Initial Release
Author:	Jack Conroy

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MAT.176C