



TAOGLAS®



Datasheet

Synergy X 6-in-1

Part No:
MA1556.W.AK.001

Description

White Synergy X - 6in1 Multiband 5M TGC-200 1 GNSS, 2 5G-4G, 3 Wi-Fi with SMA(M) RP-SMA(M) Braided Cable Assembly

Features:

- Low-profile Permanent Mount Enclosure
- 2* 5G/4G MIMO 600-6000MHz
- 3* Wi-Fi® MIMO 2.4/5.8/7.125 GHz (Including Wi-Fi® 6)
- 1* Multiband GNSS
- Worldwide 5G/4G Bands
- IP67 Waterproof Enclosure
- Dimensions: Ø161.3mm * 67mm
- 5M TGC-200 Braided Cable Assembly with SMA(M)/RP-SMA(M) connectors
- RoHS & Reach Compliant

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1. Introduction



The Taoglas **Synergy X MA1556** is a 6-in-1 next-generation permanent mount antenna designed for exceptional performance when used in conjunction with the next generation of routers.

It has been designed for high precision applications and provides excellent performance on the full GNSS spectrum including (GPS/QZSS L1/L2/L5/L6, GLONASS G1/G2/G3, Galileo E1/E5a/E5b/E6, Bei Dou B1/B2a/B2b/B3, NAVIC L5, as well as SBAS (WAAS/EGNOS/GAGAN/SDCM/SNAS) for high-performance cm-level positional accuracy which allows the user to achieve higher location accuracy, as well as stability of position tracking in urban environments with their device and with the next generation of routers.

The 6 antennas inside support 5G/4G, Multi-Band GNSS, and Wi-Fi® (2.4GHz/5-7.125GHz). The 5G/4G antennas are wideband 600MHz to 6GHz to cover the full spectrum of 5G frequencies. The Wi-Fi® antenna includes Wi-Fi® 6 and 7 capabilities to ensure your design is future-proof for the next generation of Router connectivity.

Combining Multi-band GNSS, 5G/4G, Wi-Fi® 6, and an incredibly compact PC enclosure with a fully IP67 rated waterproof, The Synergy X MA1559 is the right powerful, compact combination antenna for your application.

Typical Applications Include:

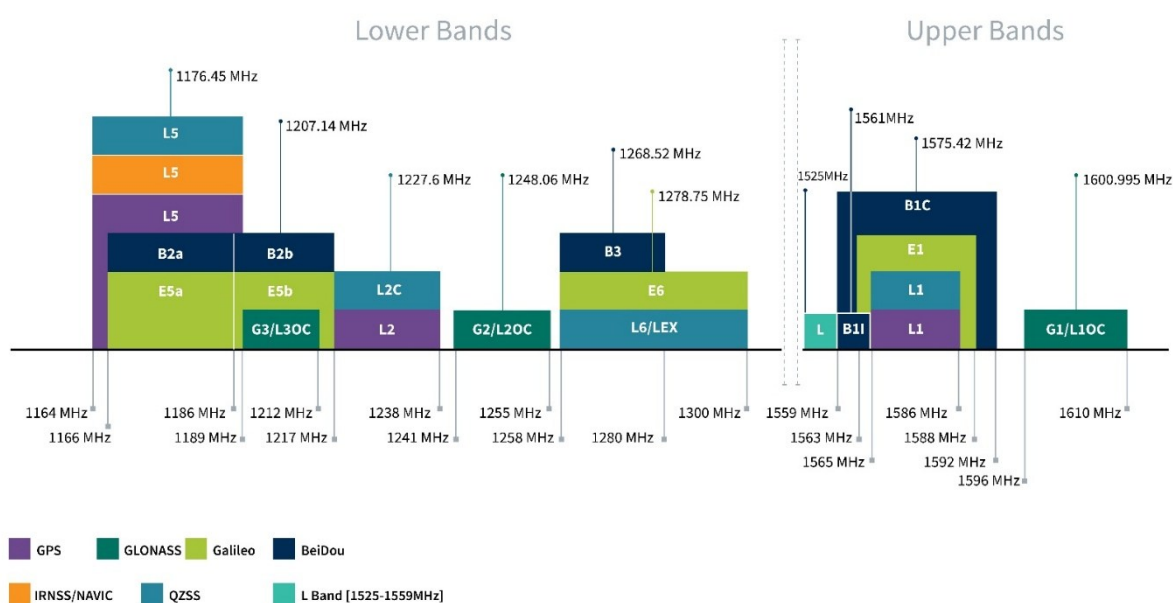
- Autonomous Driving
- Precision Positioning for Robotics
- Precision Agriculture
- Inventory Management & Container tracking
- Telematics & Asset Tracking
- Timing Accuracy Synchronization

The Synergy X MA1556 is the latest external addition to an ongoing product roadmap of high precision antennas by Taoglas. For RTK applications when used on the base and/or the rover, the MA1556 can achieve genuine cm-level accuracy.

Cable and connectors are customizable. The Synergy MA1556 is supplied with low loss TGC-200 cable extensions for longer cable runs. Please contact your regional Taoglas customer support team for further information.

2. Specification

GNSS Frequency Bands					
GPS	L1 1575.42 MHz	L2 1227.6 MHz	L5 1176.45 MHz		
	■	■	■		
GLONASS	G1 1602 MHz	G2 1248 MHz	G3 1207 MHz		
	■	■	■		
Galileo	E1 1575.24 MHz	E5a 1176.45 MHz	E5b 1201.5 MHz	E6 1278.75 MHz	
	■	■	■	■	
BeiDou	B1C 1575.42 MHz	B1I 1561 MHz	B2a 1176.45 MHz	B2b 1207.14 MHz	B3 1268.52 MHz
	■	■	■	■	■
QZSS (Regional)	L1 1575.42 MHz	L2C 1227.6 MHz	L5 1176.45 MHz	L6 1278.75e6	
	■	■	■	■	
IRNSS (Regional)	L5 1176.45 MHz				
	■				
SBAS	L1/E1/B1 1575.42 MHz	L5/B2a/E5a 1176.45 MHz	G1 1602 MHz	G2 1248 MHz	G3 1207 MHz
	■	■	■	■	■



GNSS Bands and Constellations

GNSS Electrical						
Frequency (MHz)	1176.45	1227.6	1278.75	1561	1575.42	1602
VSWR (max.)	2:1	2:1	2:1	2:1	2:1	2:1
Efficiency (%)	48	53	46	44	48	50
Peak Gain (dBi)	2.65	0.20	3.16	3.45	4.03	3.96
Average Gain (dB)	-3.16	-2.70	-3.36	-3.58	-3.16	-3.03
Axial Ratio (dB)	1.12	0.89	1.18	2.34	2.27	2.48
Group Delay Mean (ns)	12.15	5.99	11.11	34.35	26.89	30.67
Polarization	RHCP					
Impedance	50 Ω					
Passive GNSS results shown are in Free space						

LNA and Filter Electrical Properties						
Frequency (MHz)	L5 1176.45	GAL E5b 1207	GPS L2 1227	L6/E6 1278.75	B1 1561	L1 1575.42
Gain (typical)	25 dB	26 dB	25 dB	22 dB	27 dB	28 dB
Noise Figure (typical)	4.0 dB	3.7 dB	3.8 dB	4.5 dB	3.1 dB	2.6 dB
Current Draw (typical)	< 20 mA					
Input Voltage	+1.8 to +5.0 VDC					
Out-Of-Band Attenuation (dB)	100 - 900 MHz			> 50		
	900 - 1000 MHz			> 30		
	1350 - 1520 MHz			> 25		
	1700 - 2000 MHz			> 35		
	2000 - 6000 MHz			> 45		

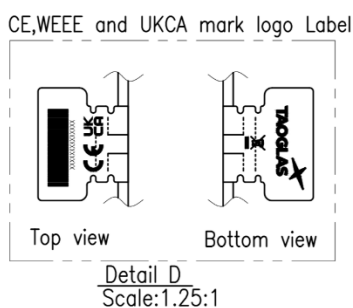
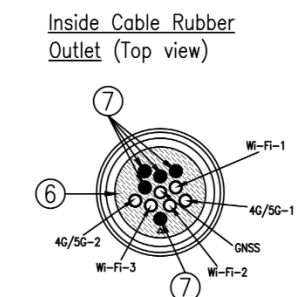
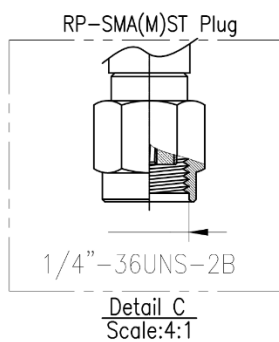
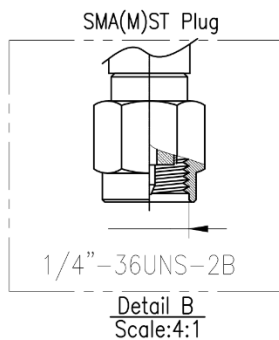
Cellular Electrical										
Band	Frequency (MHz)	MIMO	Measurement	Efficiency (%)	Average Gain (dB)	Peak Gain (dBi)	Impedance	Polarization	Radiation Pattern	Max. input power
5G NR/4G Band 71	617-698	MIMO 1	Free Space	48.7	-3.13	1.49	50 Ω	Linear	Omni directional	10W
			Gound Plane	21.2	-6.73	-0.15				
		MIMO 2	Free Space	45.1	-3.46	0.53				
			Gound Plane	18.6	-7.31	-0.47				
4G/3G Band 12,13,14,17,28,29	698-824	MIMO 1	Free Space	46.9	-3.29	1.45				
			Gound Plane	30.0	-5.23	0.12				
		MIMO 2	Free Space	45.6	-3.41	0.74				
			Gound Plane	28.7	-5.42	-1.24				
4G/3G/NB-IoT/Cat M Band 5,8,18,19,20,26,27	824-960	MIMO 1	Free Space	52.4	-2.80	1.51				
			Gound Plane	42.5	-3.72	2.85				
		MIMO 2	Free Space	51.6	-2.88	1.29				
			Gound Plane	42.1	-3.76	3.34				
5G NR/4G Band 21,32,74,75,76	1427-1518	MIMO 1	Free Space	58.6	-2.32	2.79				
			Gound Plane	53.6	-2.71	3.00				
		MIMO 2	Free Space	56.3	-2.50	1.74				
			Gound Plane	54.0	-2.68	3.18				
4G/3G Band 1,2,3,4,9,23,25,35,39,66	1710-2200	MIMO 1	Free Space	50.8	-2.94	2.72				
			Gound Plane	50.5	-2.96	4.54				
		MIMO 2	Free Space	47.6	-3.23	1.19				
			Gound Plane	48.2	-3.17	3.54				
4G/3G Band 7,30,38,40,41	2300-2690	MIMO 1	Free Space	64.7	-1.89	4.20				
			Gound Plane	68.0	-1.67	5.65				
		MIMO 2	Free Space	64.2	-1.93	4.13				
			Gound Plane	67.0	-1.74	4.94				
LTE5200/Wi-Fi5800	5150-5925	MIMO 1	Free Space	64.8	-1.89	7.32				
			Gound Plane	62.3	-2.05	9.29				
		MIMO 2	Free Space	41.5	-3.82	4.82				
			Gound Plane	50.5	-2.97	8.16				
5G NR/4G Band 22,42,48,77,78,79	3300-5000	MIMO 1	Free Space	53.4	-2.73	6.00				
			Gound Plane	52.1	-2.83	6.98				
		MIMO 2	Free Space	61.1	-2.14	5.44				
			Gound Plane	62.6	-2.03	8.11				
*Tested with Staggered cables 150-350mm										

Wi-Fi Electrical										
Band	Frequency (MHz)	MIMO	Measurement	Efficiency (%)	Average Gain (dB)	Peak Gain (dBi)	Impedance	Polarization	Radiation Pattern	Max. input power
Wi-Fi - 2GHz	2400-2500	MIMO 1	Free Space	54.4	-2.65	2.34	50 Ω	Linear	Omni directional	10W
			Gound Plane	50.6	-2.96	3.67				
		MIMO 2	Free Space	50.5	-2.96	2.06				
			Gound Plane	50.5	-2.97	4.14				
		MIMO 3	Free Space	53.4	-2.73	1.65				
			Gound Plane	49.0	-3.10	3.52				
Wi-Fi - 5GHz	5150-5850	MIMO 1	Free Space	54.3	-2.65	4.78				
			Gound Plane	51.0	-2.93	7.46				
		MIMO 2	Free Space	52.3	-2.82	4.25				
			Gound Plane	48.6	-3.13	6.88				
		MIMO 3	Free Space	49.8	-3.03	4.35				
			Gound Plane	51.1	-2.92	6.84				
Wi-Fi - 6GHz	5925-7125	MIMO 1	Free Space	47.6	-3.22	5.95				
			Gound Plane	58.4	-2.34	9.01				
		MIMO 2	Free Space	47.1	-3.27	6.14				
			Gound Plane	40.3	-3.94	7.50				
		MIMO 3	Free Space	38.1	-4.19	5.04				
			Gound Plane	58.6	-2.32	8.80				
*Tested with Staggered cables 150-350mm										

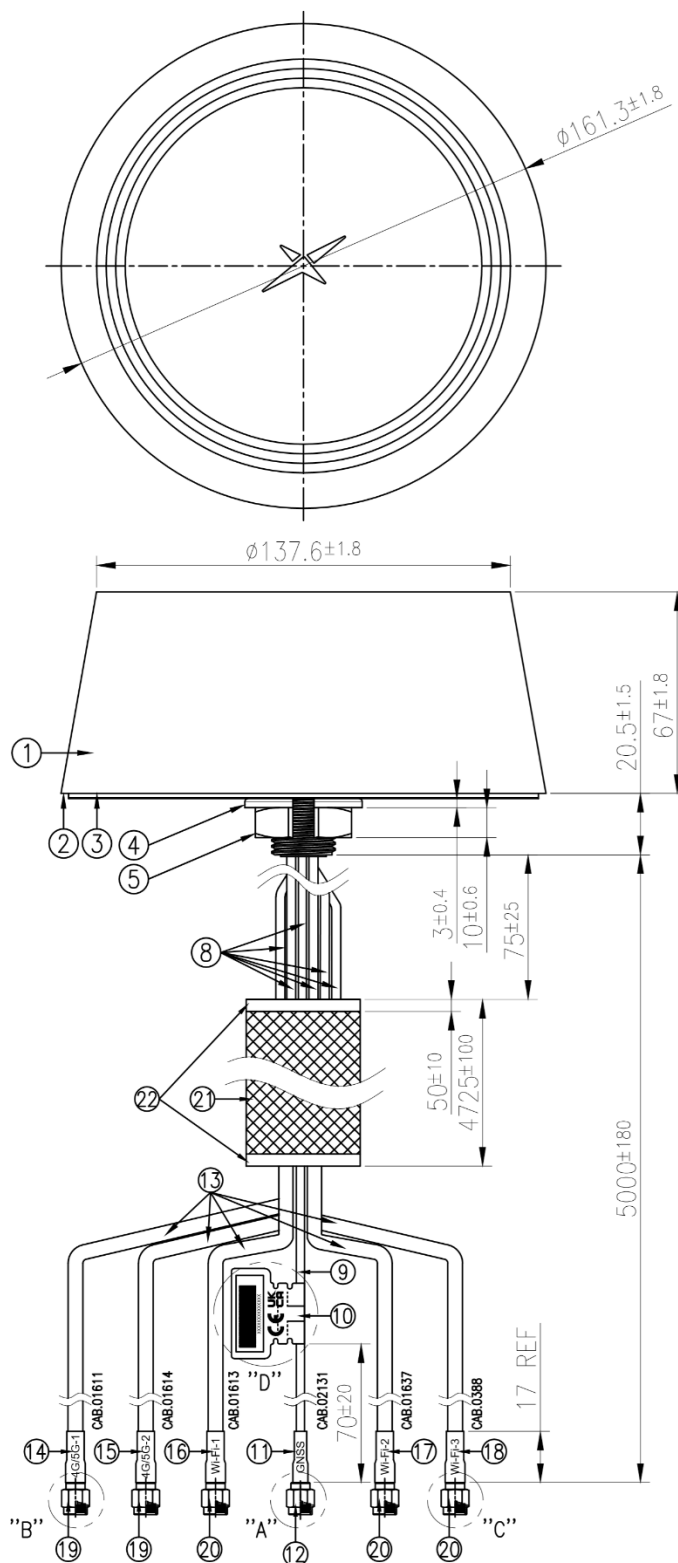
Mechanical	
Dimensions	Ø161.3mm * 67mm
Weight	2.3 Kg
Material	PC
Connector	SMA (M) & RP SMA(M)
Cable	TGC200 (see ME drawing)

Environmental	
Protection	IP67
Temperature Range	-40°C to 85°C
Humidity	Non-condensing 65°C 95% RH
RoHS Compliant	Yes
REACH Compliant	Yes

3. Mechanical Drawing



	Name	Material	Finish	QTY
1	Top Plastic Shell	PC	White	1
2	Bottom Plastic	PC	Black	1
3	Double Sided Adhesive	E4308+3M 0448HK	Black Foam/White Liner	1
4	Washer_Cut	Steel	Zn-Ni Plated	1
5	Nut_M2x2.0Px10H Cut	Steel	Zn-Ni Plated	1
6	Rubber	Silicone Rubber	Black	1
7	Grommet plug_R6174	ASA	Black	5
8	R6174 Coated Cable(MA1506.W.001)	PVC	Black	6
9	R6174 Coated Cable(CAB.02131)	PVC	Black	1
10	CE/WEEE/UKCA mark logo Label	PEPA	White	1
11	Heat Shrink Tube (GNSS)	PE	Blue Tube/White Text	1
12	SMA(M)ST for R6174	Brass	Au Plated	1
13	TOC-200 Coaxial Cable	PE	Black	5
14	Heat Shrink Tube (4G/5G-1)	PE	Red Tube/White Text	1
15	Heat Shrink Tube (4G/5G-2)	PE	Red Tube/White Text	1
16	Heat Shrink Tube (Wi-Fi-1)	PE	Yellow Tube/Black Text	1
17	Heat Shrink Tube (Wi-Fi-2)	PE	Yellow Tube/Black Text	1
18	Heat Shrink Tube (Wi-Fi-3)	PE	Yellow Tube/Black Text	1
19	SMA(M)ST	Brass	Au Plated	2
20	RP-SMA(M)ST	Brass	Au Plated	3
21	Centenary Braid	BSPET	Black	1
22	Heat Shrink Tube	PE With Glue	Black	2



4. Installation Instructions

A Introduction

The Taoglas Synergy X is an external permanent mount, combination antenna that can be provided with combinations of one active GNSS, four 5G/4G and 4 dual-band Wi-Fi antennas. The Synergy is available with an M22 threaded boss for surface mounting, along with 3M adhesive for added sealing. The Synergy X is ideal for vehicle panels of up to 6mm (0.23") thick with a threaded boss length of 20.5mm (0.81"). The Synergy X is IP67 rated and also includes an foam gasket to seal from any water ingress on the mounting surface.



Electrical Safety

The Synergy contains 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

B Mounting & Location

For prime performance, the Synergy X is recommended to be fitted on a metal panel. Optimum ground plane size is 300mm x 300mm (11.8" x 11.8"). When mounting on a vehicle roof panel ensure to mount on a flat surface, and measure for a central position. Care should be taken to mount the Synergy antenna as far as possible from other roof-mounted features such as the aircon unit, light bar etc.



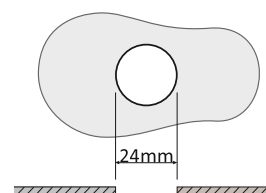
Sealing

In order to ensure that the installation is properly sealed against the mounting surface care must be taken regarding curvature of the mounting panel. It is highly recommended to install the antenna on a clean, flat and level surface. After installation the compression of the foam gasket and adhesive against the mounting panel should be checked and a small bead of neutral cure silicone sealant can be applied around the periphery of the enclosure if required.

C Surface Preparation

When preparing to drill the hole, mask the area around the hole position to protect the surface. Drill a pilot hole and increase the hole size to $\varnothing 24\text{mm}$ ($\frac{7}{8}"$). Ensure the drill bit does not contact the headliner. Deburr and clean the area around the hole carefully removing all waste.

Remove paint and primer from under panel surface to ensure adequate earth contact by washer and nut. Apply petroleum jelly or paint around cut edge of the hole to prevent corrosion



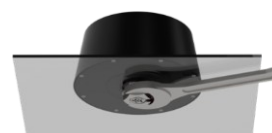
D Adhesive Patch

On the underside of the antenna there is a 3M adhesive foam gasket. Peel away the 3M adhesive protection and feed the cables through the hole. Position the antenna over the hole and press down onto the panel with pressure. This adhesion will make ensure will be securely mounted and will also allow for extremely minimal curvature on the roof of a vehicle.



E Securing the Mount

A split nut is used to easily fit onto the thread through the cables. The nut is attached from the underside of the panel, it should easily twist onto the thread and then secured in place with a final tighten with a spanner. After tightening, double check the antenna to make sure that it is properly secured.



Torque Values	kgf-cm	N-m
Plastic Nut	85 ±5	8.3 ±0.5
Metal Nut	180 ±5	17.6 ±0.5

F Cable Routing and Connection

The pigtail cables supplied are RG-174 for all feeds. The heatshrink will denote which cable is which for ease of installation. Connect each individual connector to the correct port of the router, if any cable is unused please fit a 50Ω terminator to the individual connection.



G 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 equipment in an explosive atmosphere.



European Waste Electronic Equipment Directive 2012/19/EU

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



Hazardous Substances Directive (RoHS) 2011/65/EU / 2015/863/EU Directive 2014/53/EU Radio Equipment Directive (RED)

View CE Certificate online:

<https://www.taoglas.com/wp-content/uploads/pdf/CE-Declaration-of-Conformity-RED-RoHS-MA15XX-Synergy-Series.pdf>

Harmonised Standards and References:

EN 301 489-1 (V2.2.1): ElectroMagnetic Compatibility (EMC) standard for radio equipment and services;
Part 1: Common technical requirements. Referencing CENELEC EN 55032 Class B.

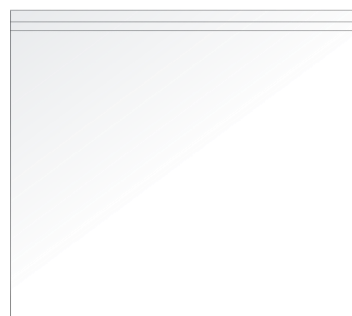
Waiver: This document represents information compiled by Taoglas to the best of our current knowledge. This is not intended to be used as a representation or warranty of fitness of the products described for any particular purpose. This document details guidelines for general information purposes only. 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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5. Packaging



1pc MA1556 per PE Bag
Weight (Kg): 2.55 $\pm$ 3%



4pcs MA1556 per Carton
Carton Dimensions: 740 x 370 x 300 mm
Weight (Kg): 11.2 $\pm$ 3%

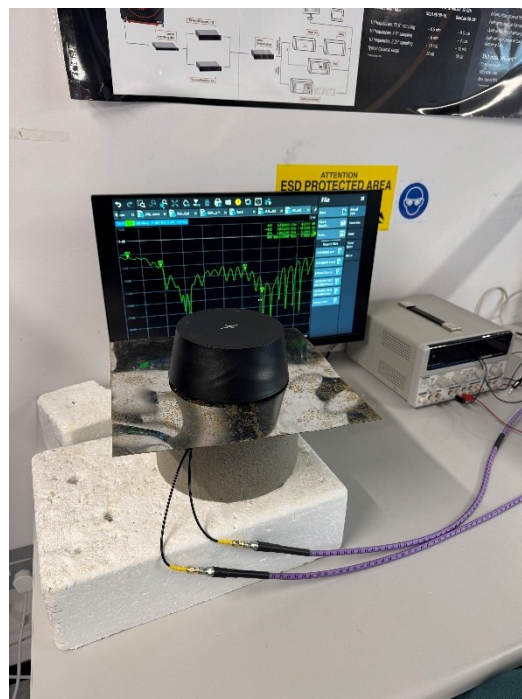
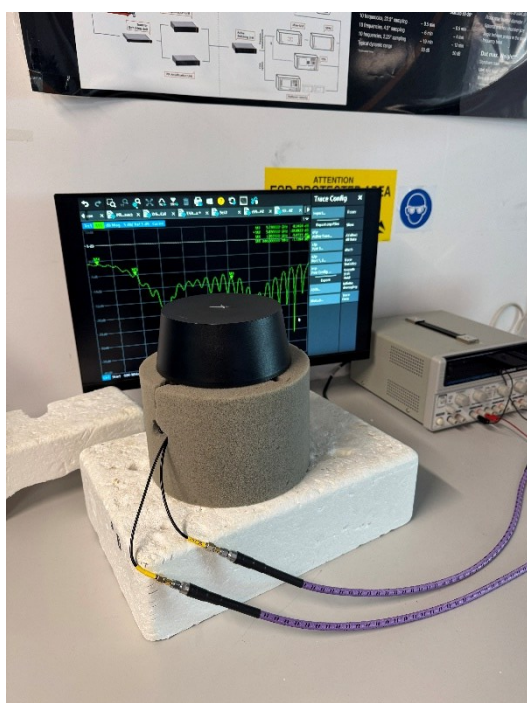


6. Antenna Characteristics

6.1 Test Setup

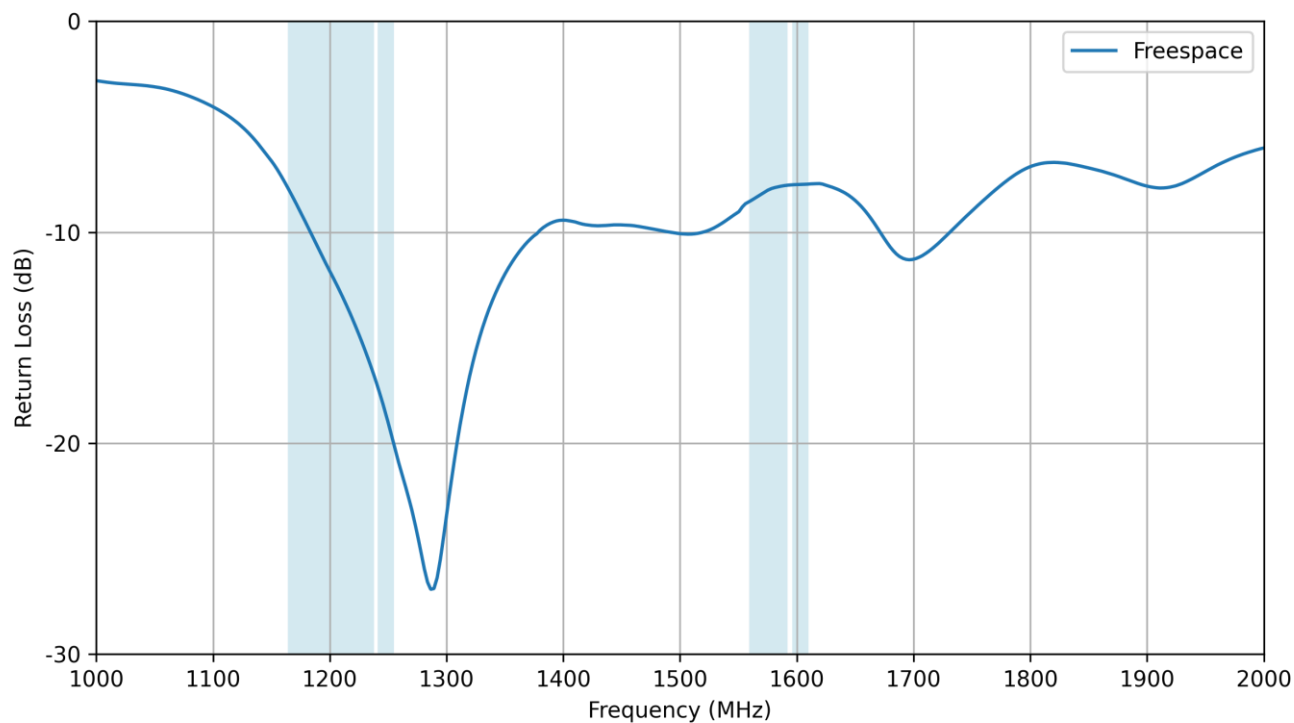
AUT

Vector Network Analyzer

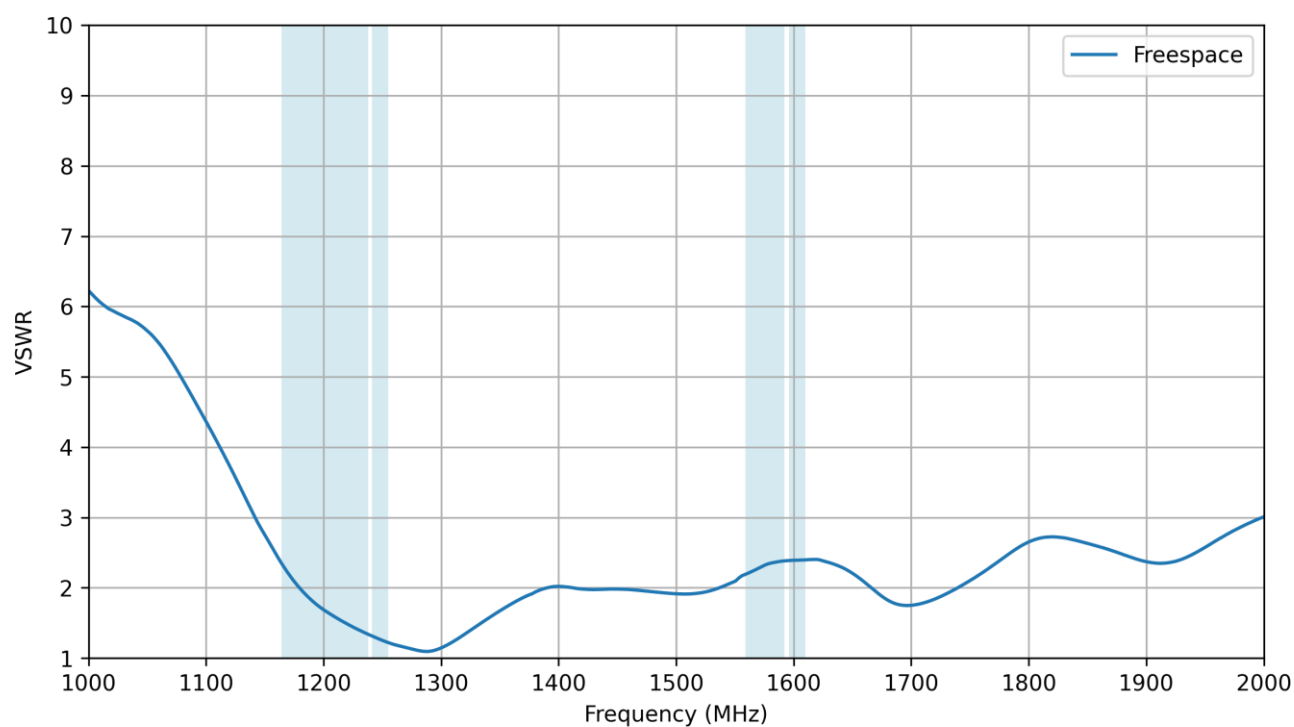


VNA Test Set-Up in Free Space and on a 30x30cm Ground Plane

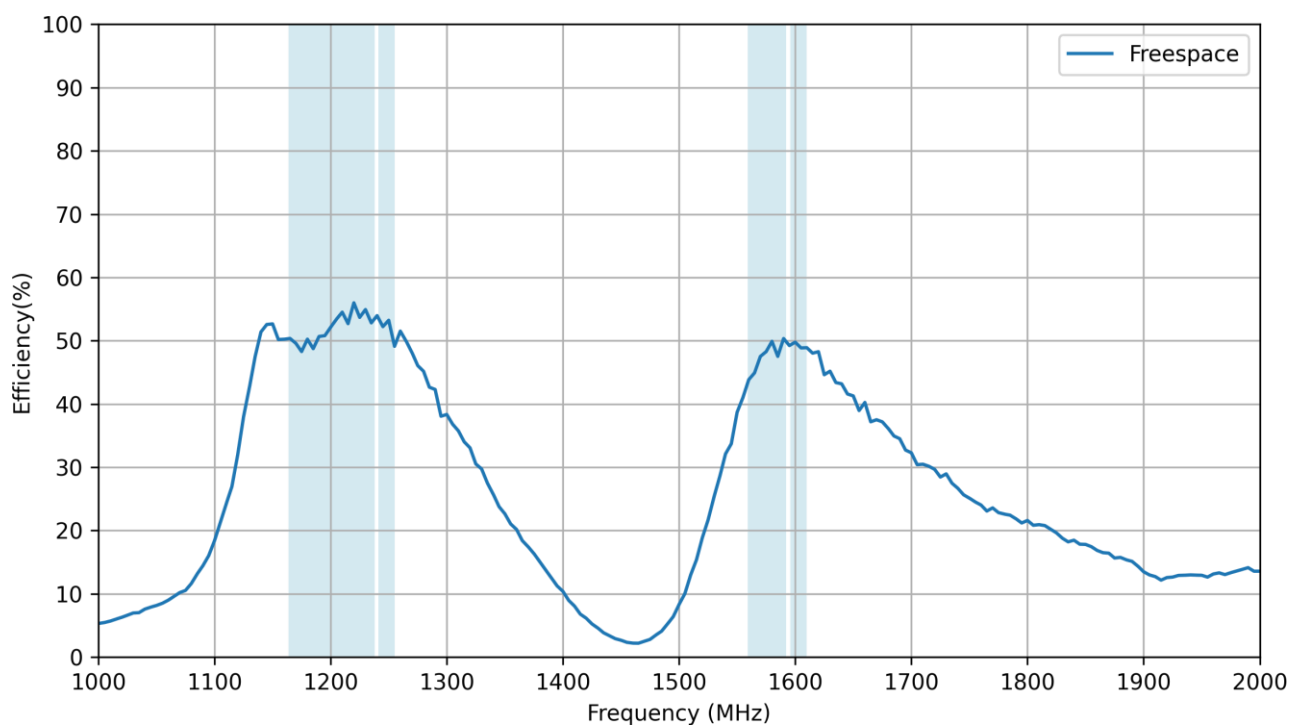
6.2 GNSS - Return Loss



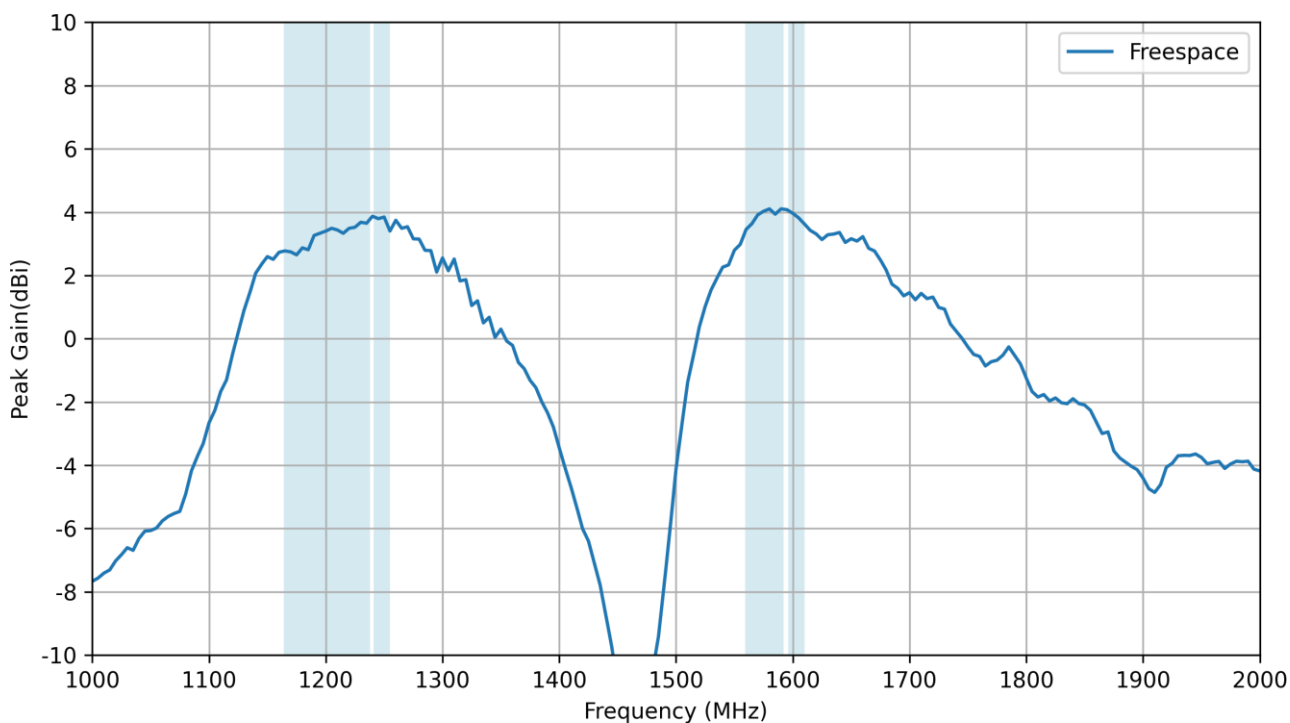
6.3 GNSS - VSWR



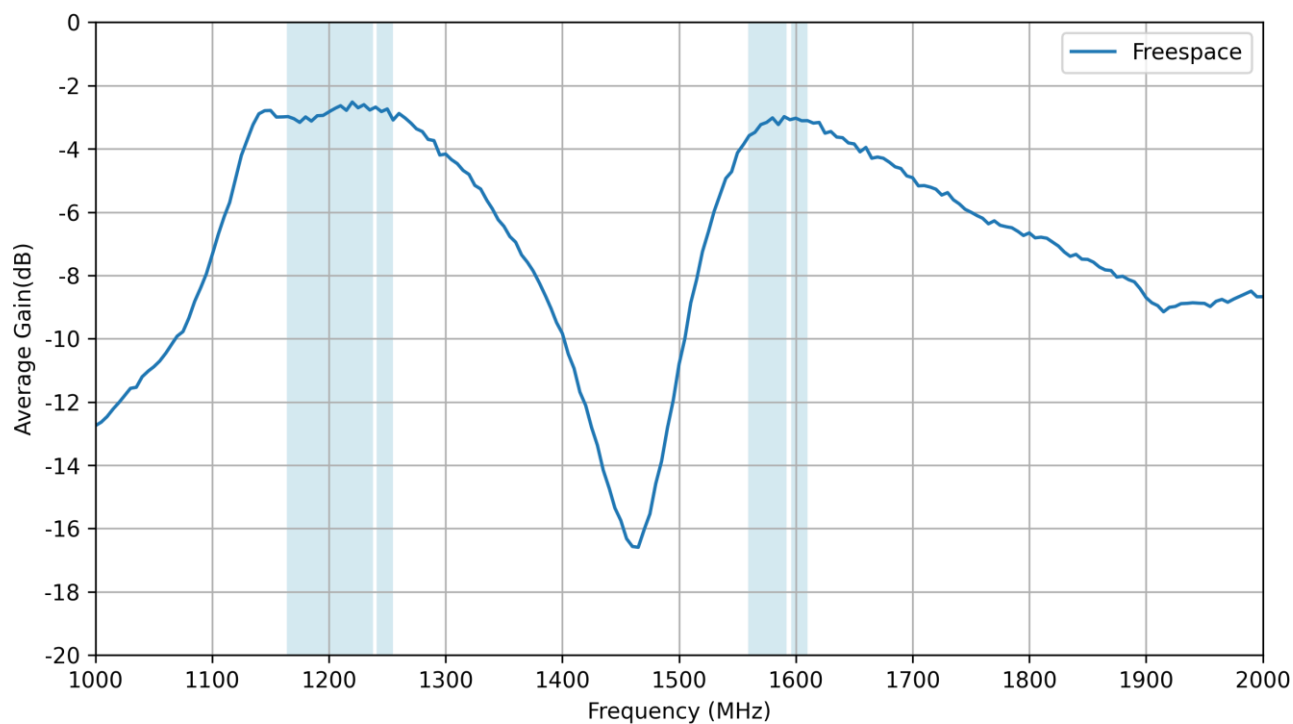
6.4 GNSS - Efficiency



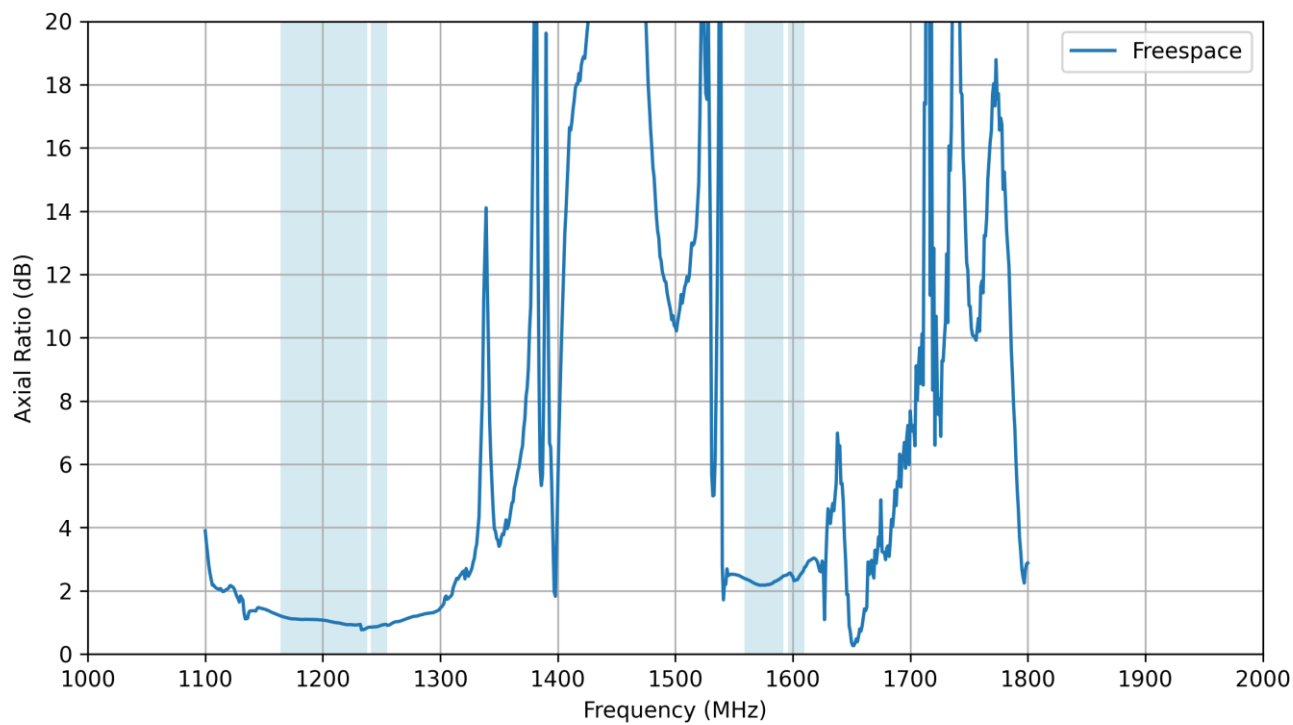
6.5 GNSS – Peak Gain



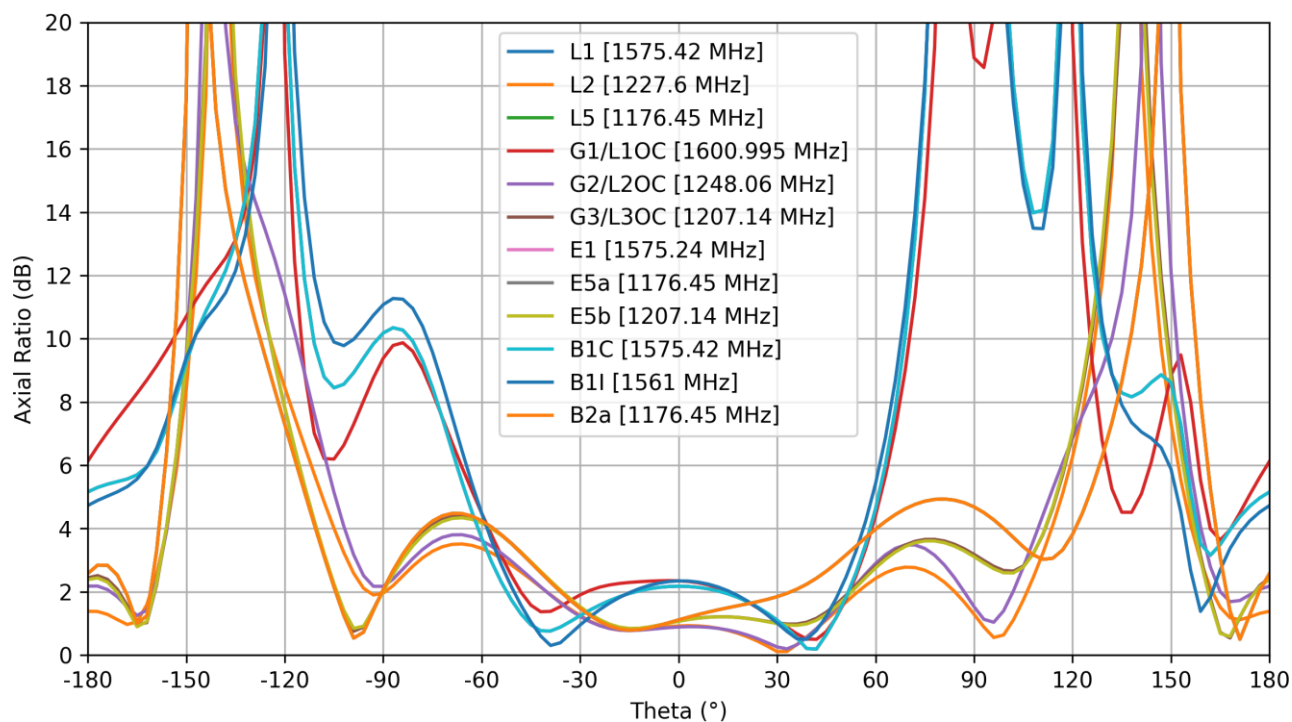
6.6 GNSS – Average Gain



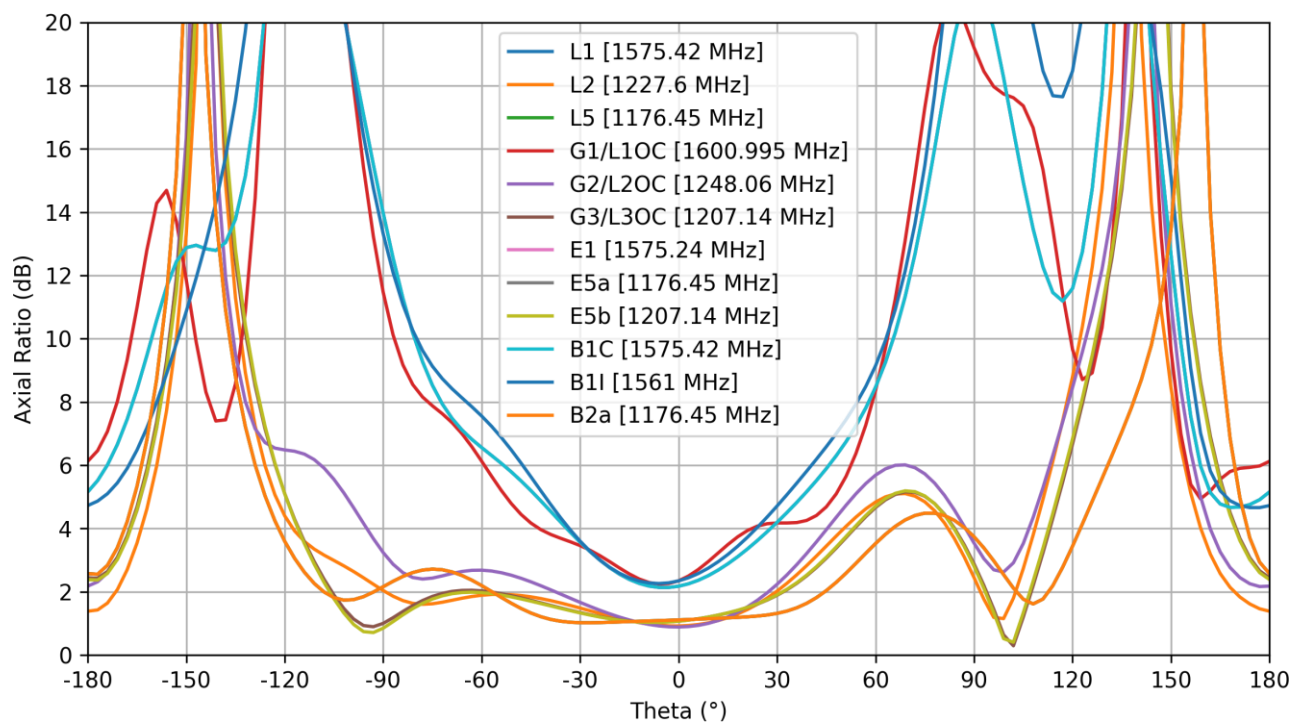
6.7 GNSS - Axial Ratio



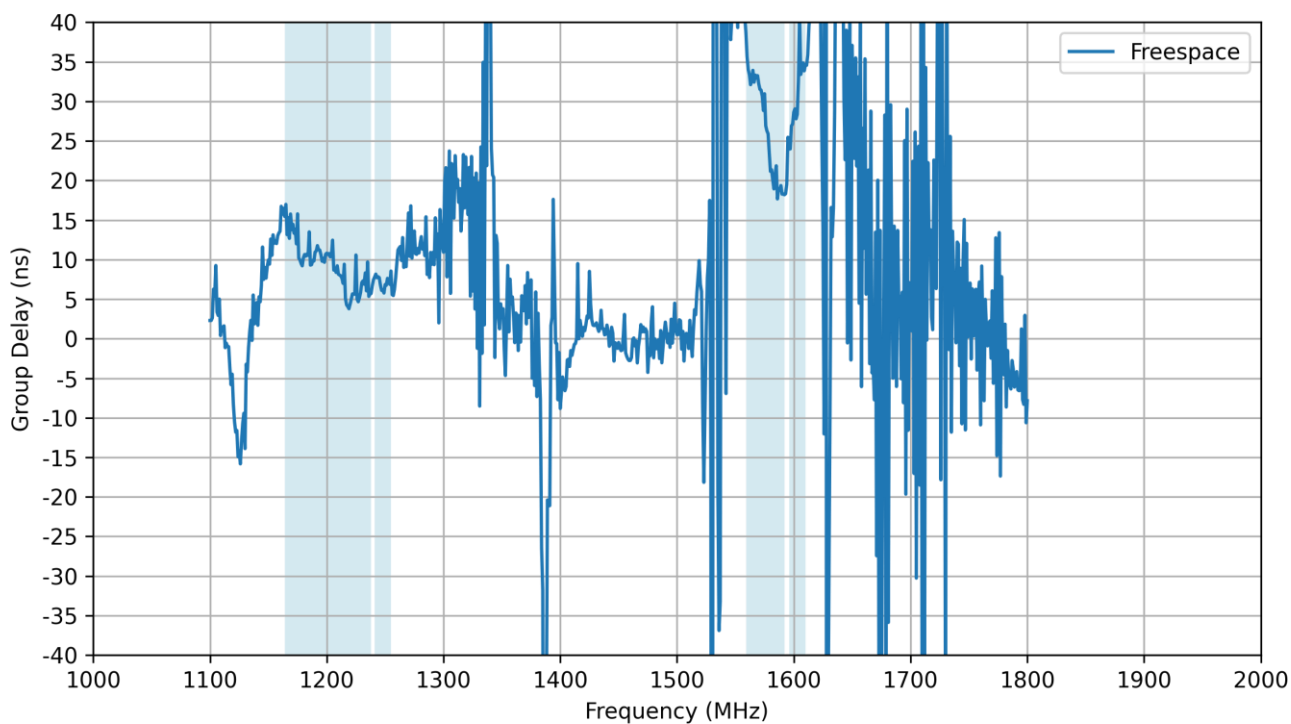
6.8 GNSS - Axial Ratio vs Angle for Phi=0



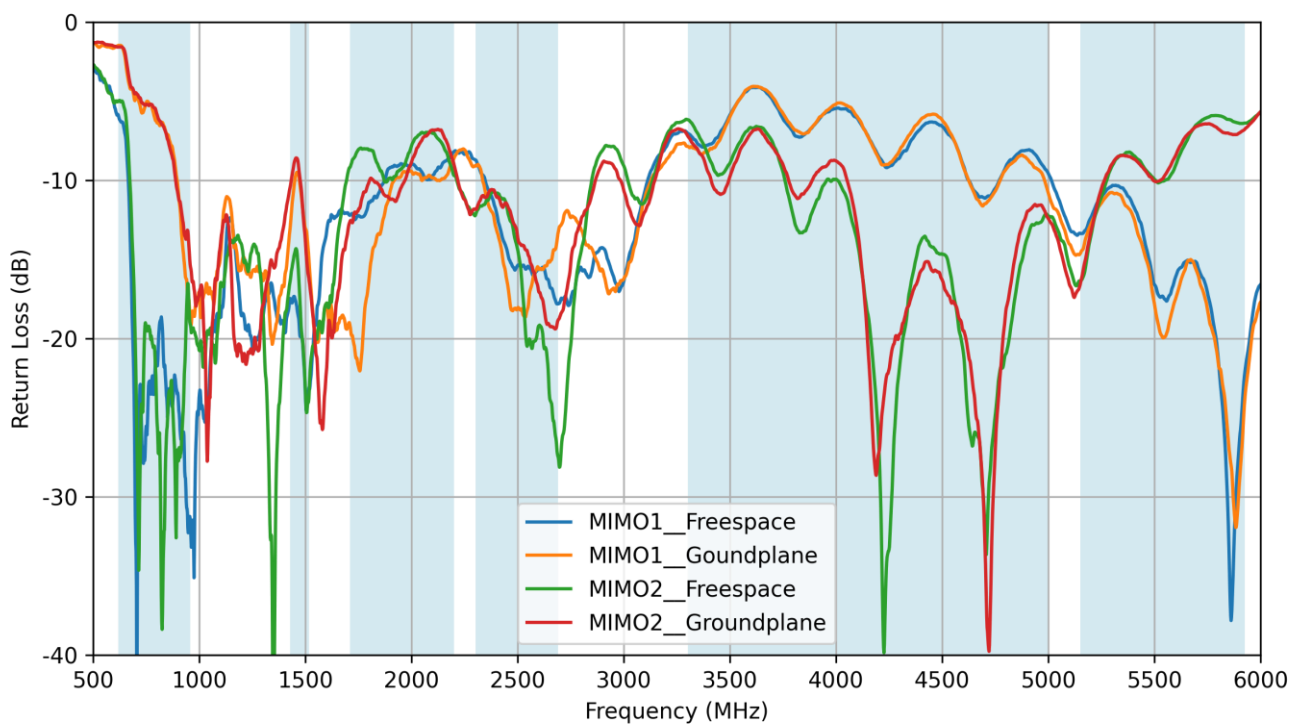
6.9 GNSS - Axial Ratio vs Angle for Phi=90



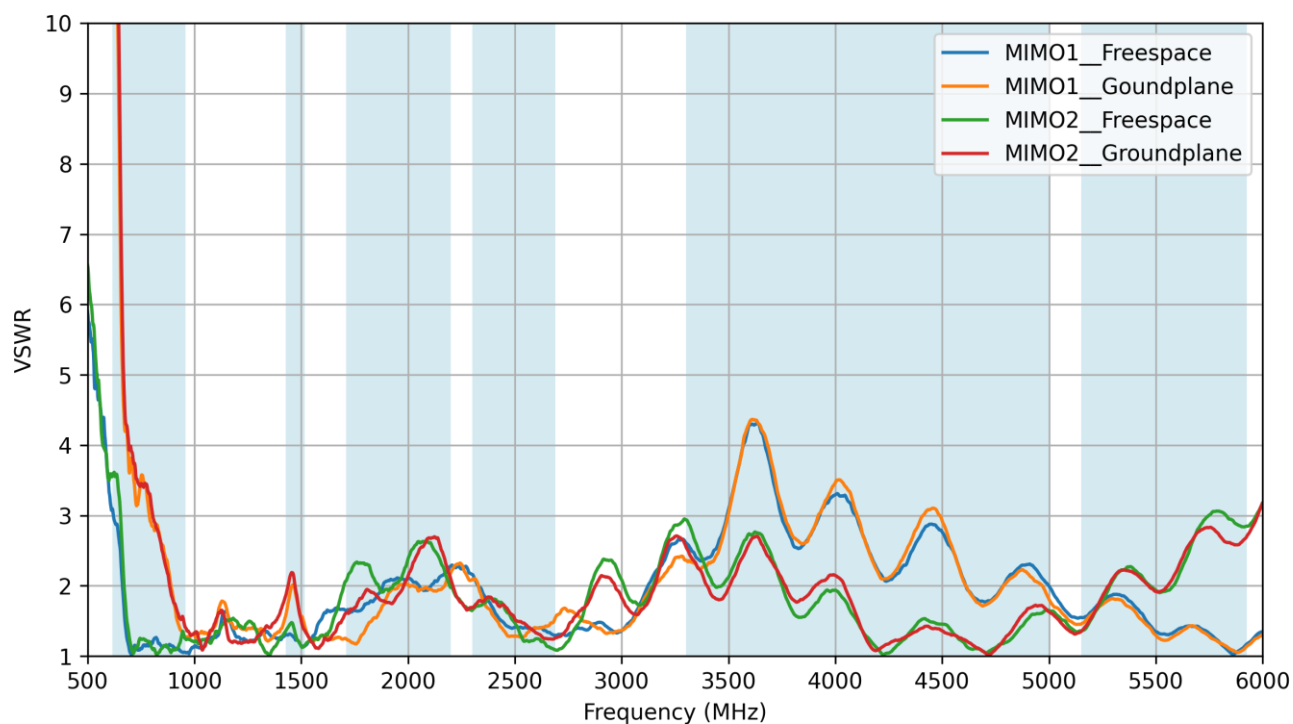
6.10 GNSS - Group Delay



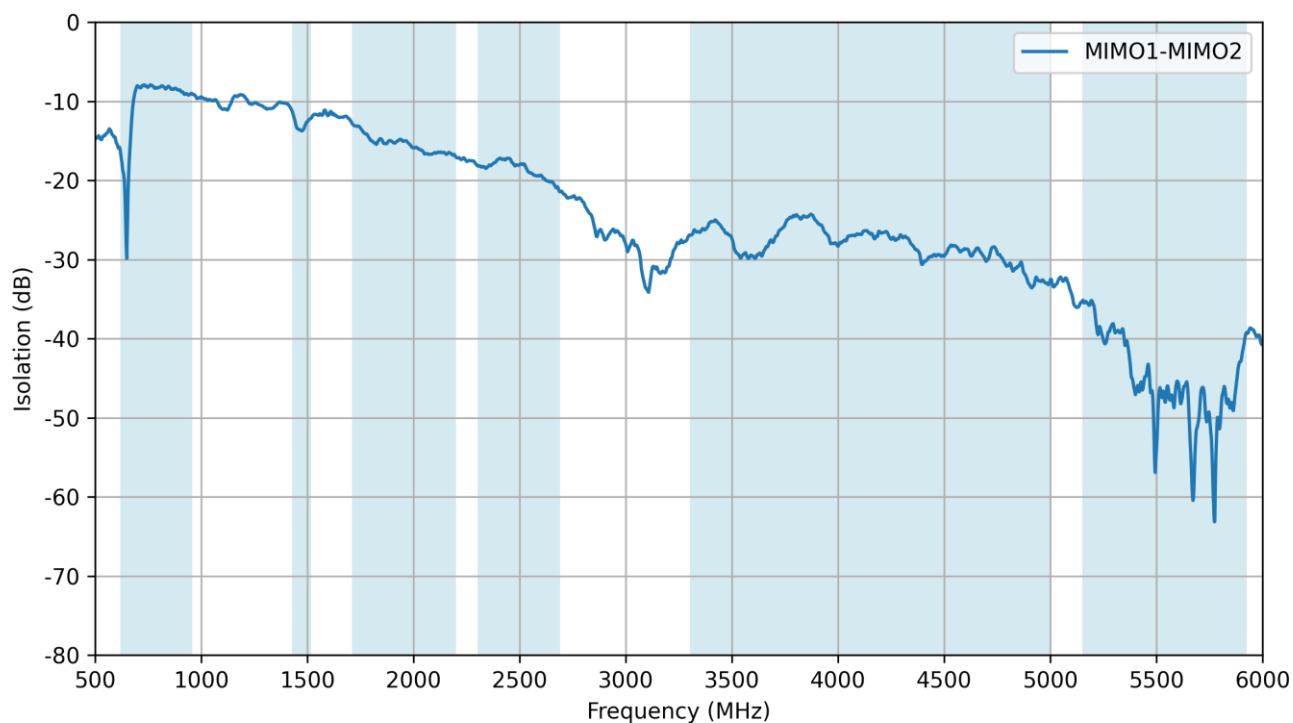
6.11 Cellular - Return Loss



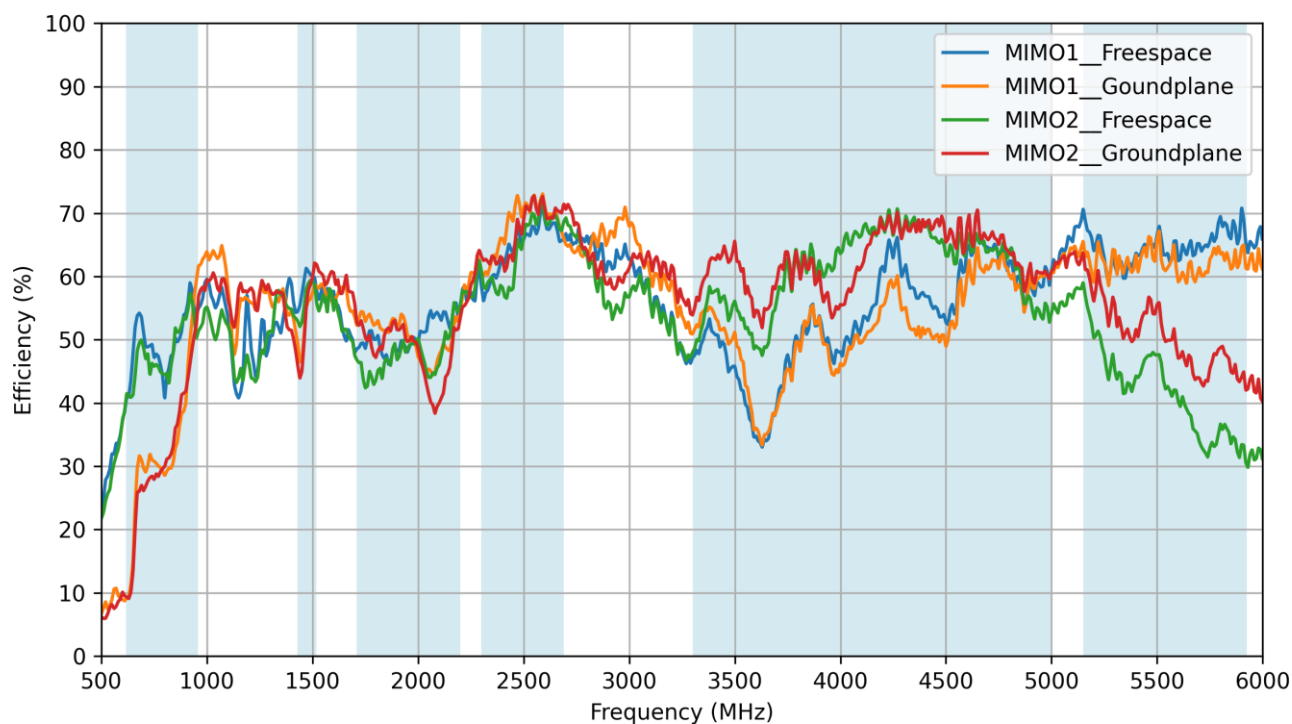
6.12 Cellular - VSWR



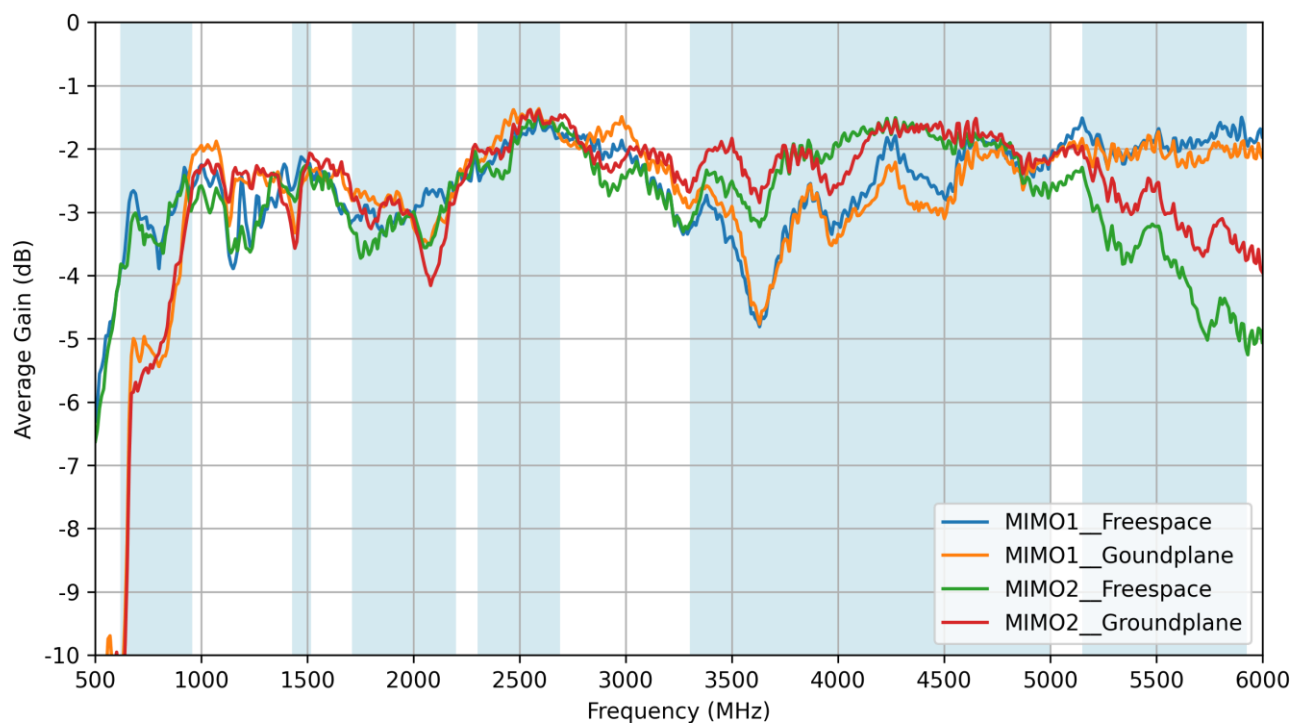
6.13 Cellular - Isolation



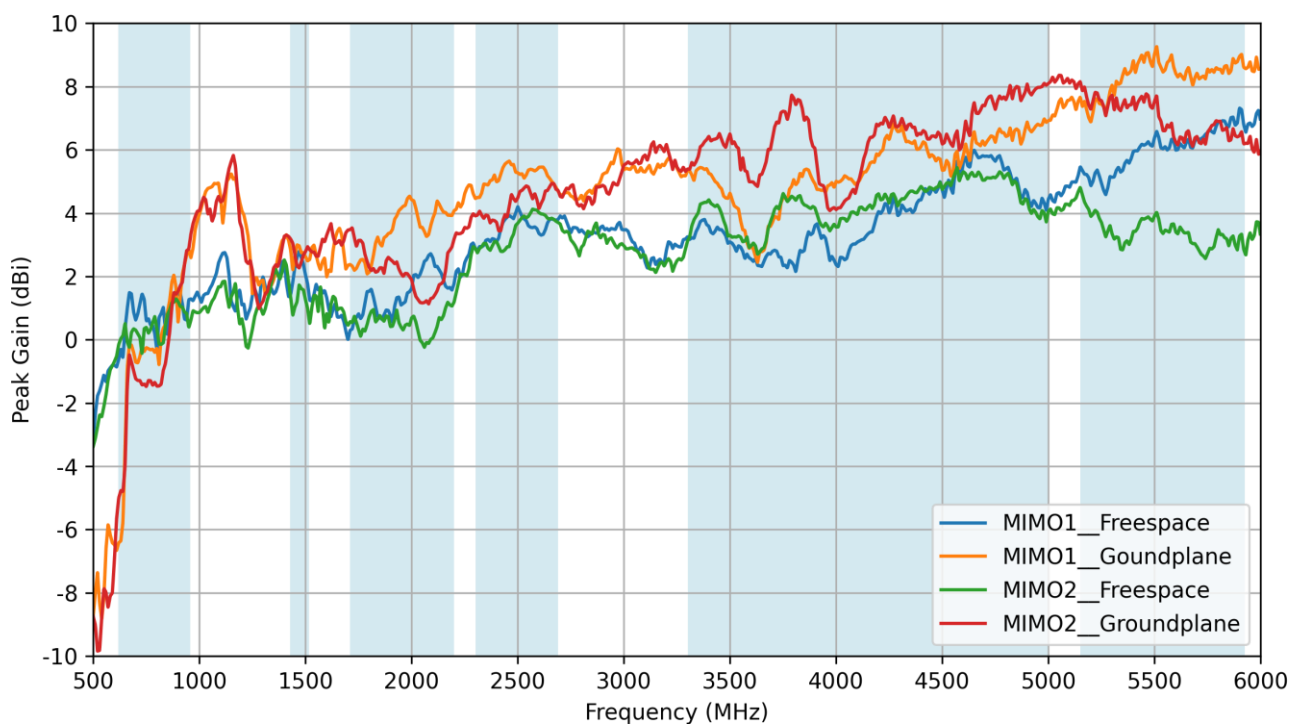
6.14 Cellular - Efficiency



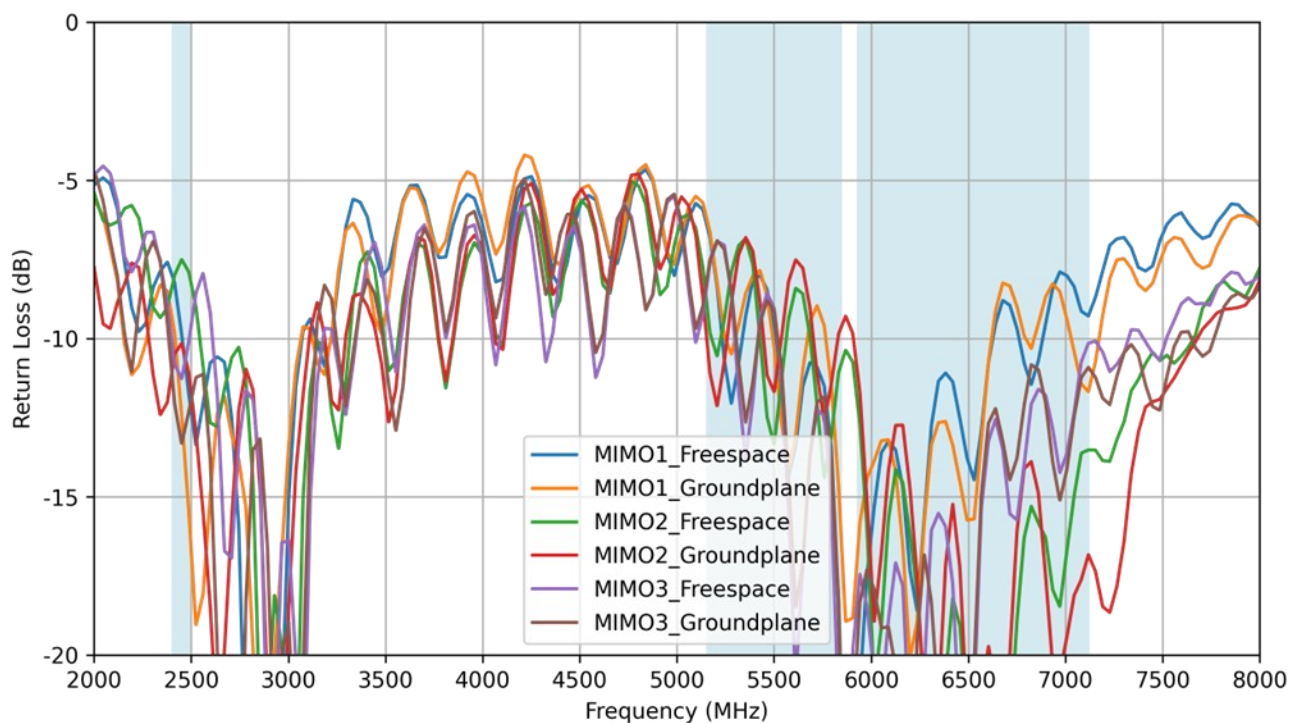
6.15 Cellular - Average Gain



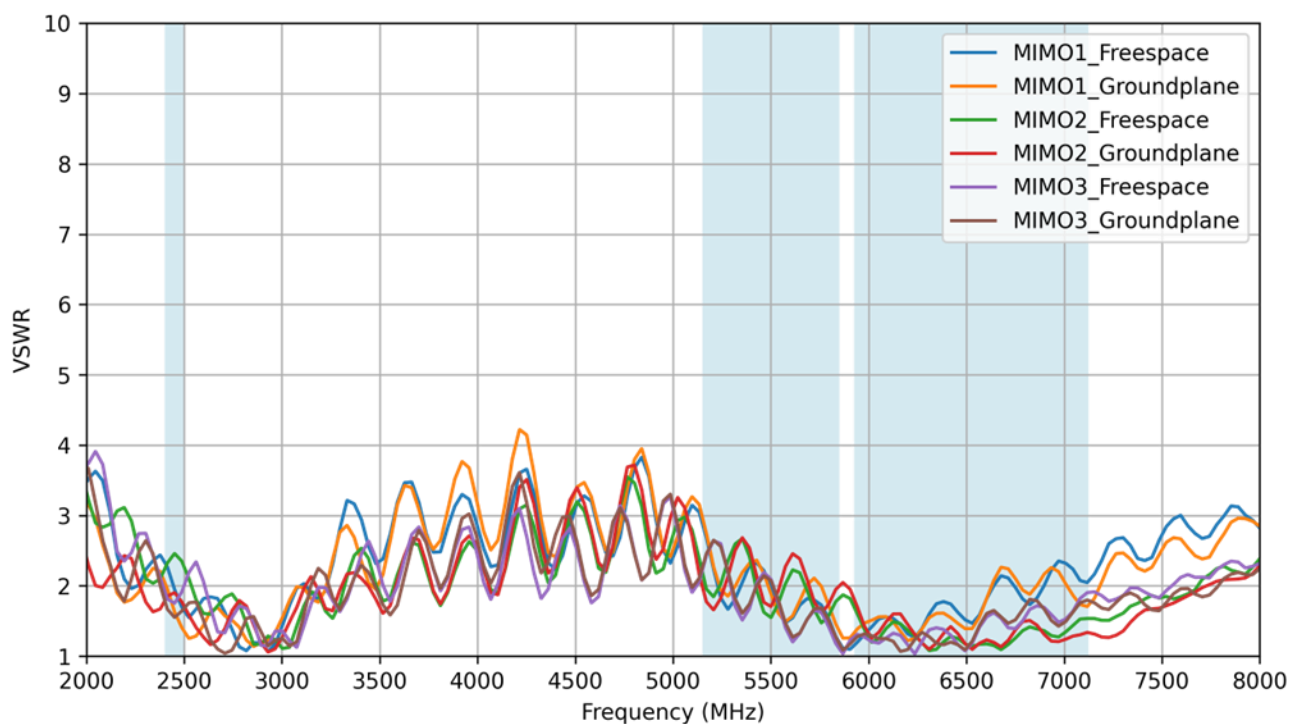
6.16 Cellular - Peak Gain



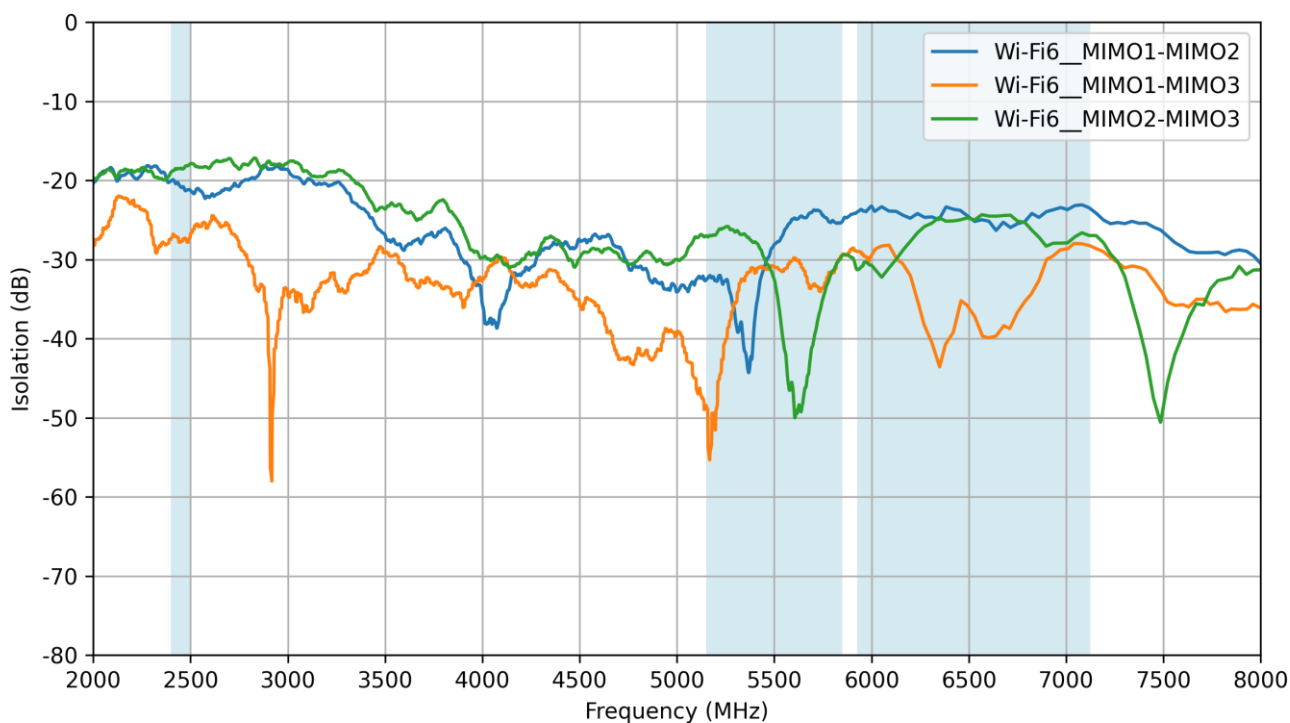
6.17 Wi-Fi - Return Loss



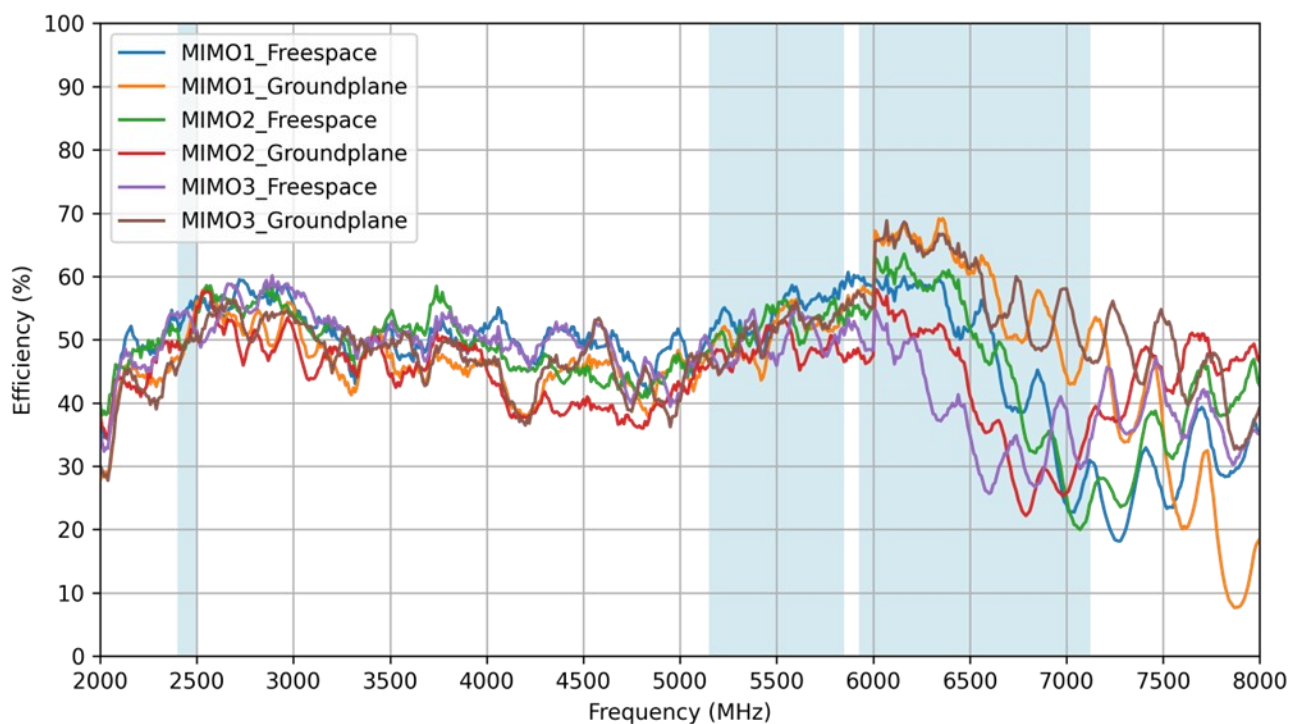
6.18 Wi-Fi - VSWR



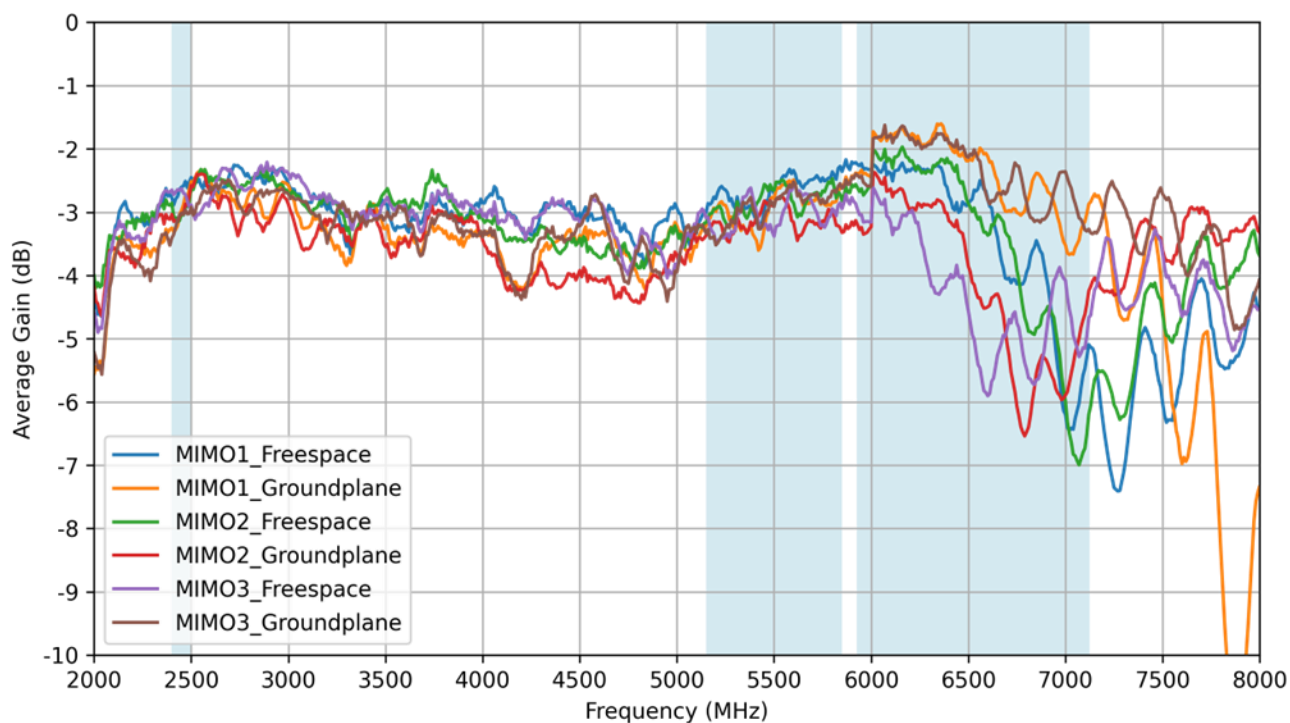
6.19 Wi-Fi - Isolation



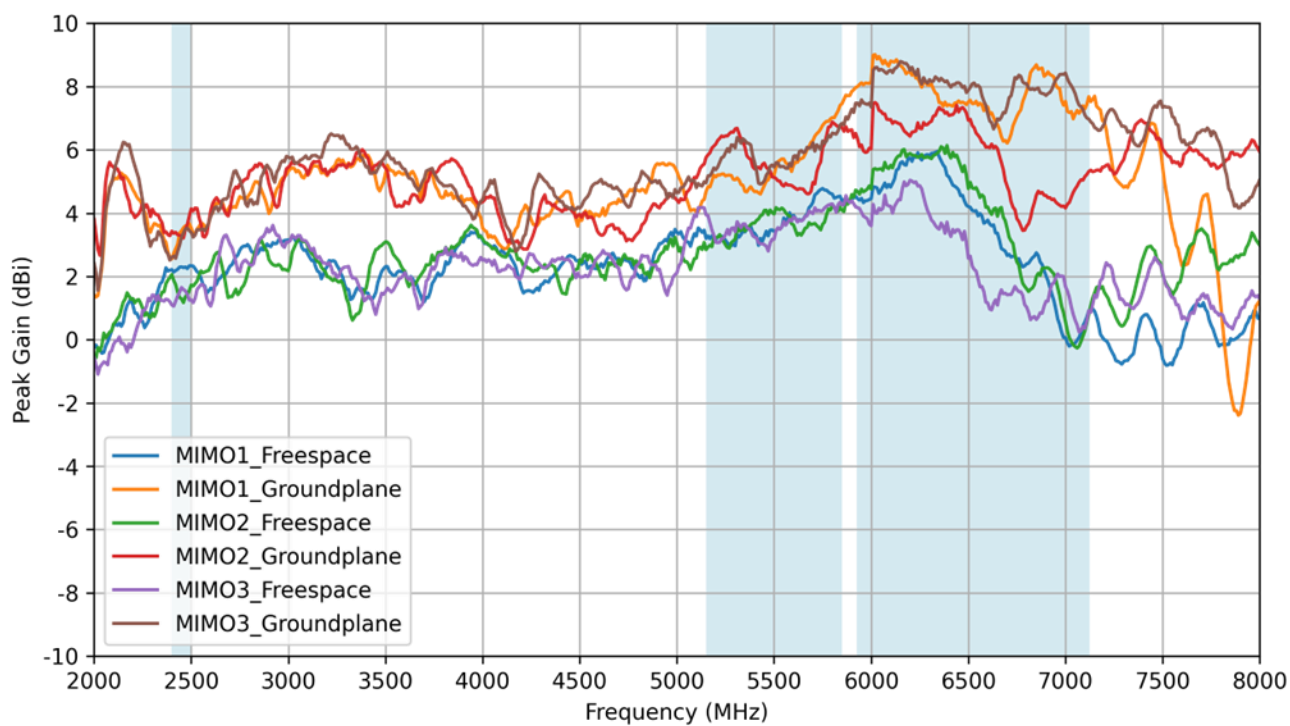
6.20 Wi-Fi - Efficiency



6.21 Wi-Fi - Average Gain

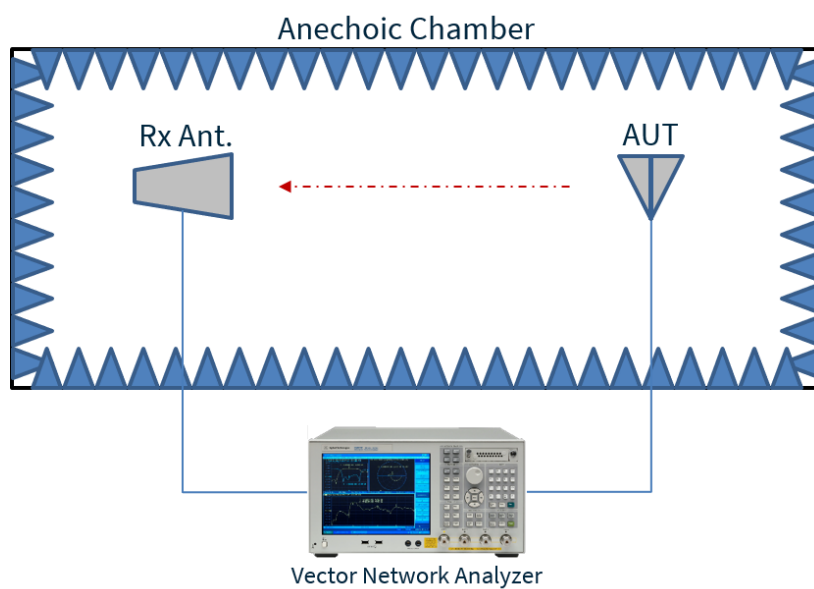


6.22 Wi-Fi - Peak Gain

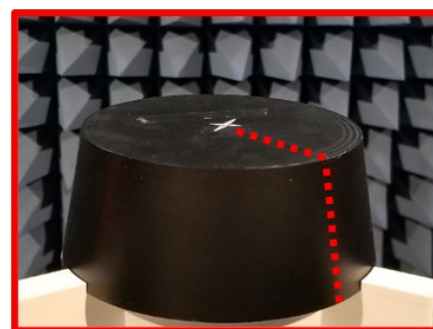


7. Radiation Patterns

7.1 Test Setup



Antenna tested with underside-notch/logo centered along Y-Axis.

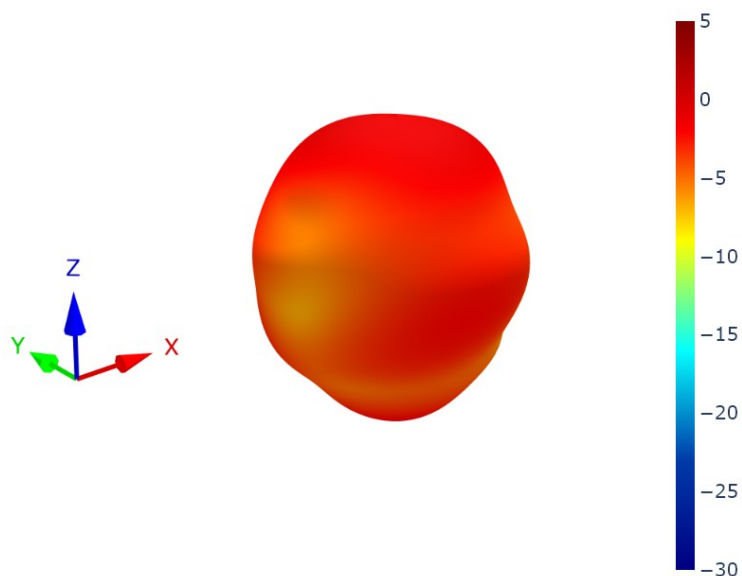


Y-Axis Location.

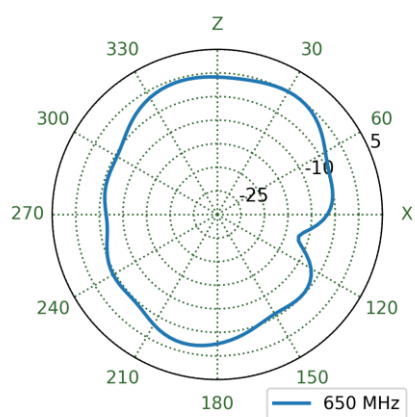


Underside-notch.

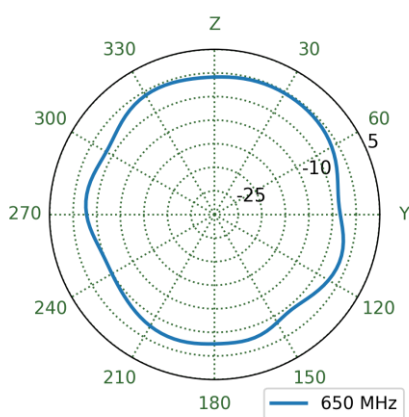
7.2 MIMO1 Cellular Free Space Patterns at 650 MHz



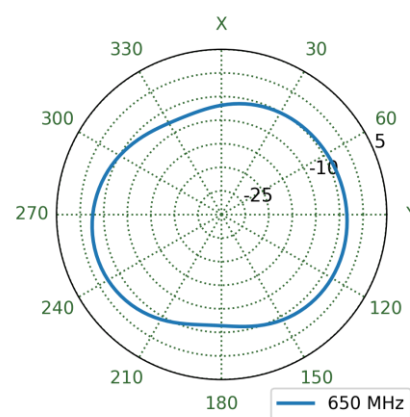
XZ Plane



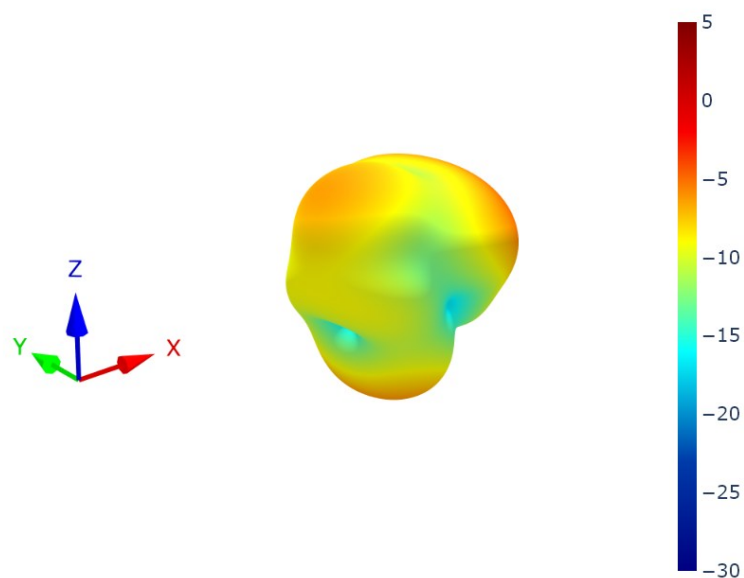
YZ Plane



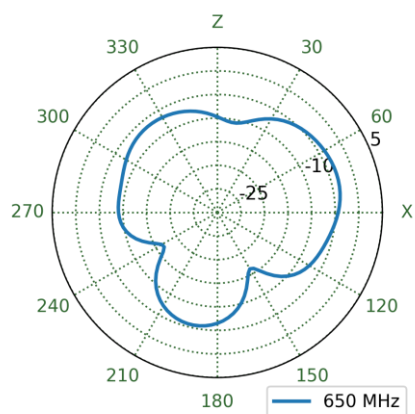
XY Plane



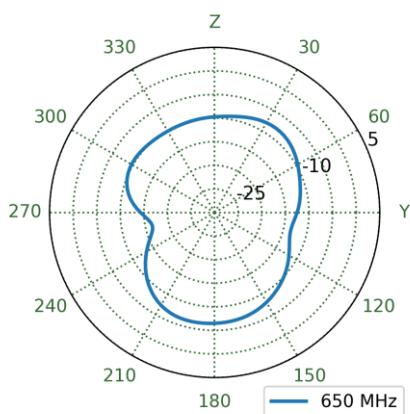
7.3 MIMO1 Cellular Gound Plane Patterns at 650 MHz



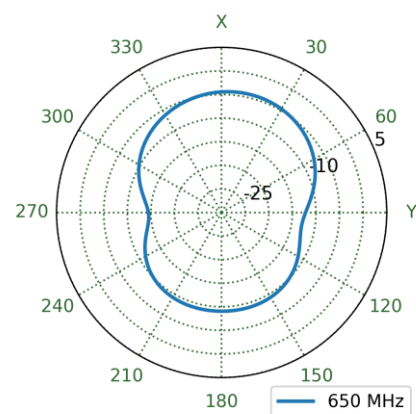
XZ Plane



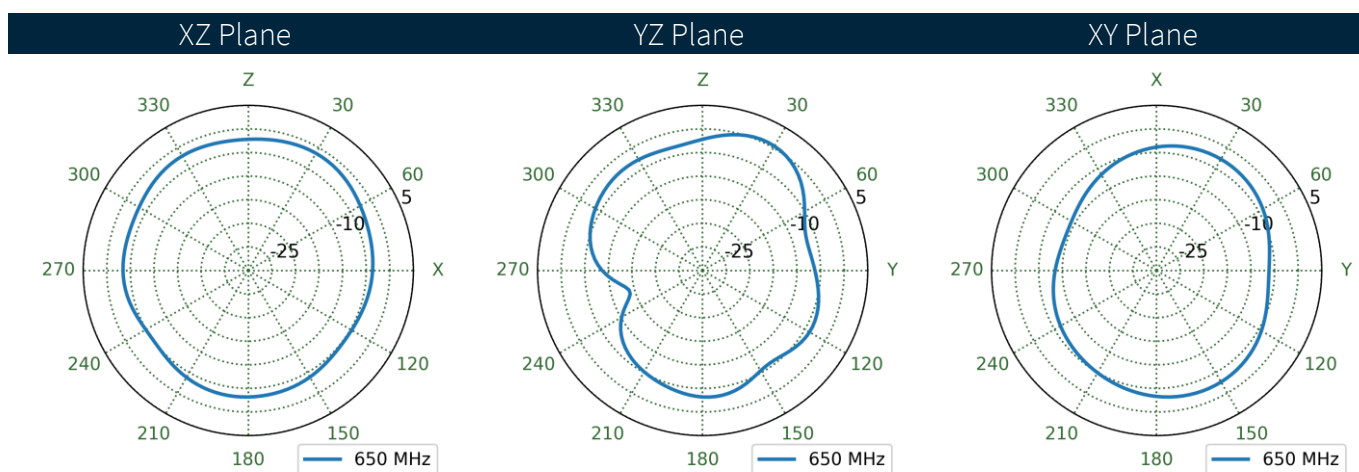
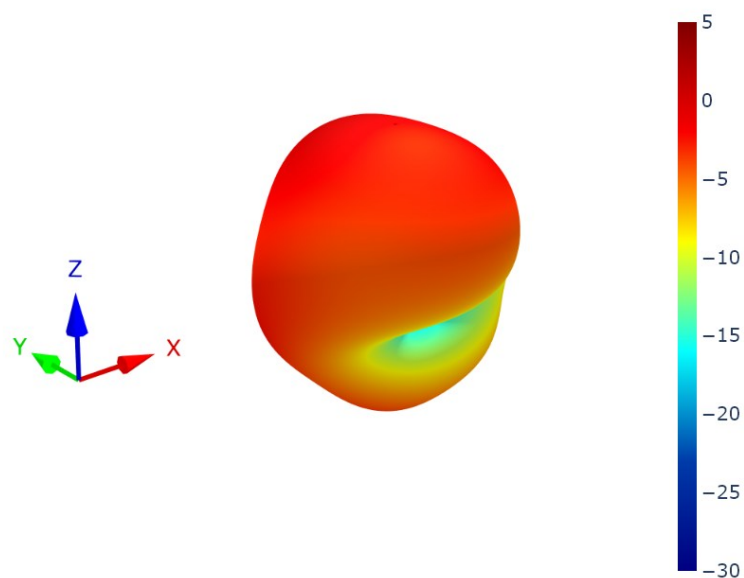
YZ Plane



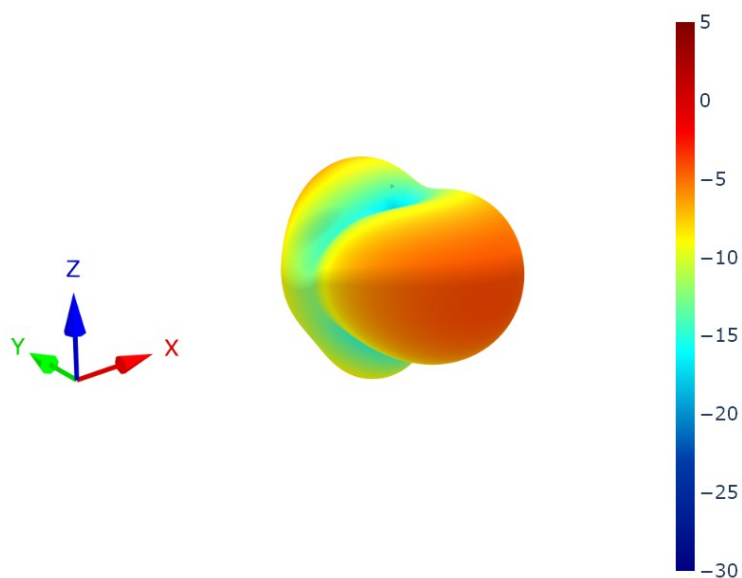
XY Plane



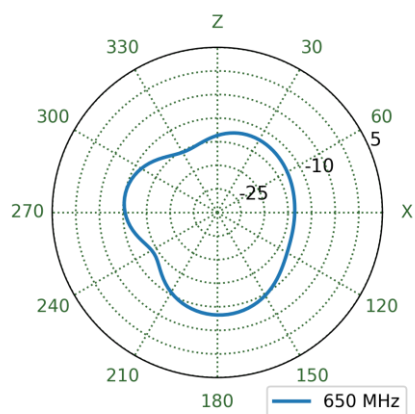
7.4 MIMO2 Cellular Free Space Patterns at 650 MHz



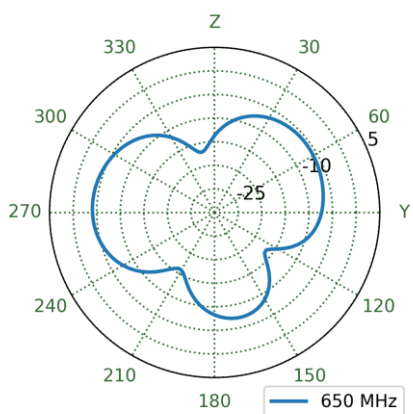
7.5 MIMO2 Cellular Ground Plane Patterns at 650 MHz



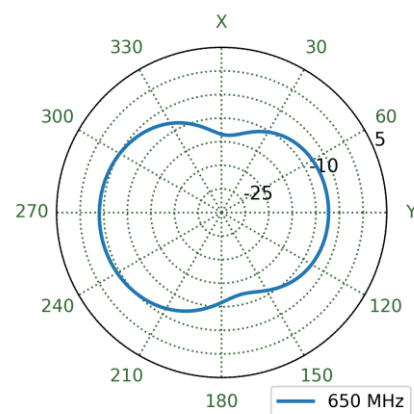
XZ Plane



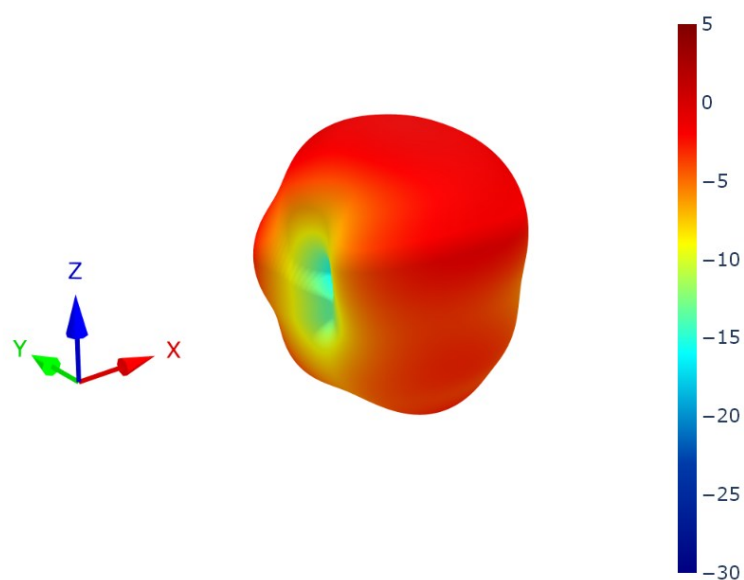
YZ Plane



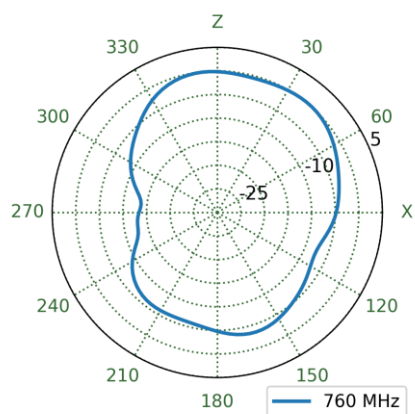
XY Plane



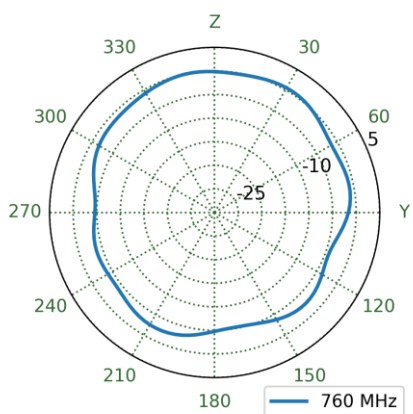
7.6 MIMO1 Cellular Free Space Patterns at 760 MHz



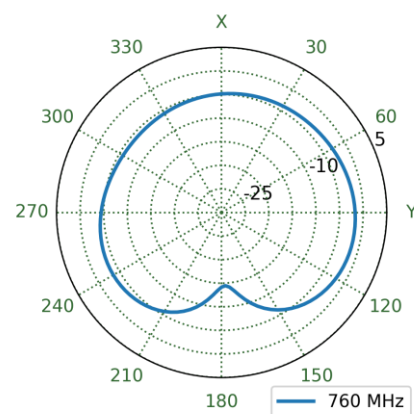
XZ Plane



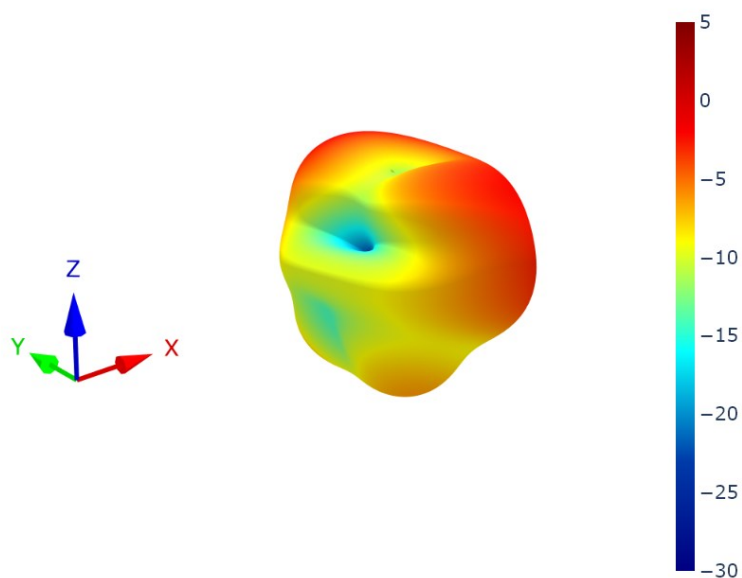
YZ Plane



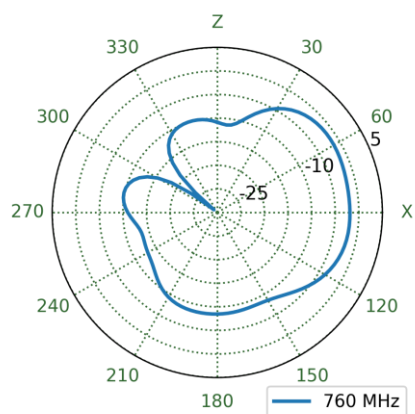
XY Plane



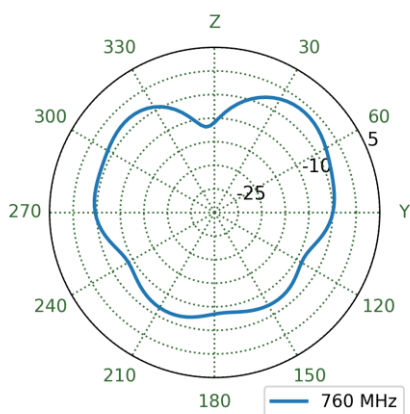
7.7 MIMO1 Cellular Gound Plane Patterns at 760 MHz



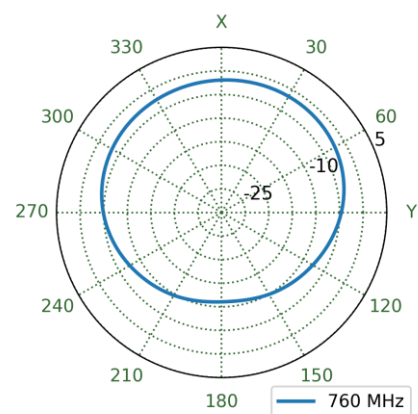
XZ Plane



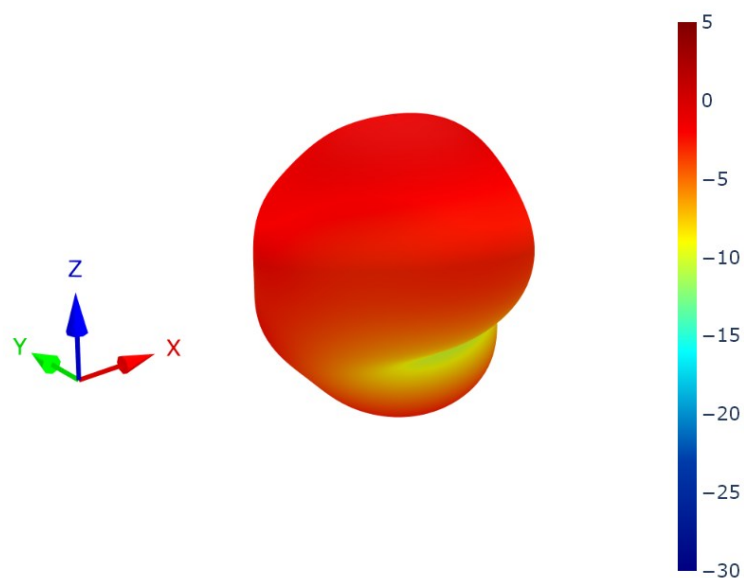
YZ Plane



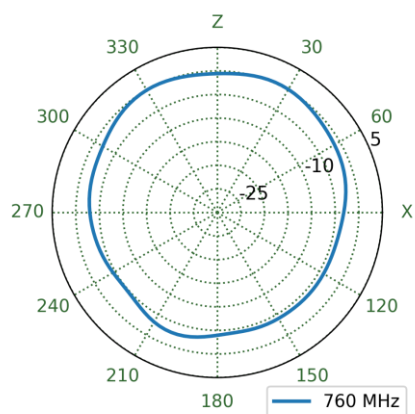
XY Plane



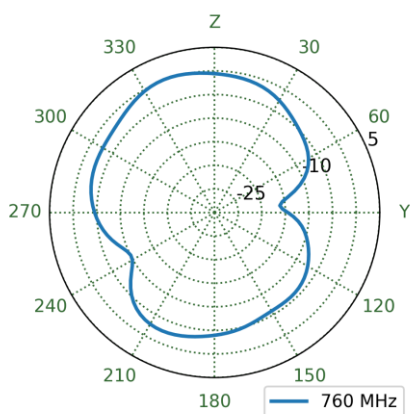
7.8 MIMO2 Cellular Free Space Patterns at 760 MHz



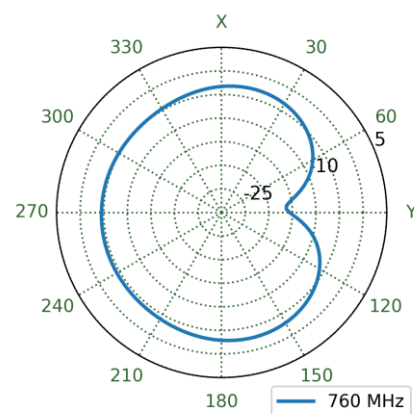
XZ Plane



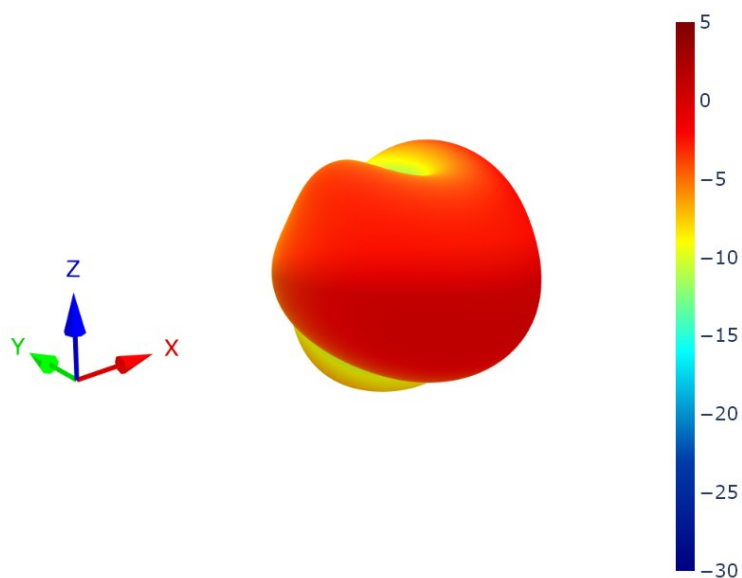
YZ Plane



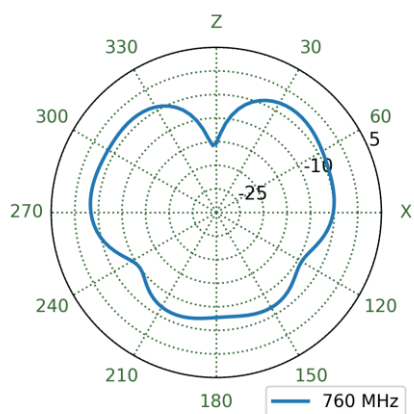
XY Plane



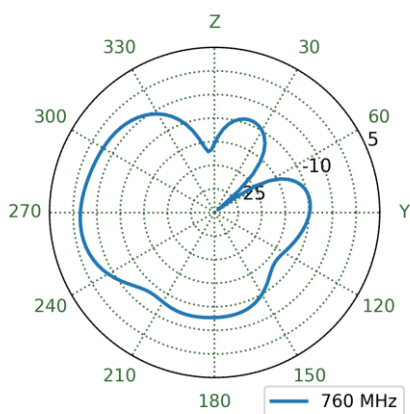
7.9 MIMO2 Cellular Ground Plane Patterns at 760 MHz



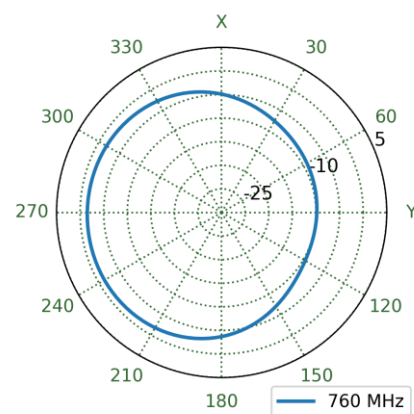
XZ Plane



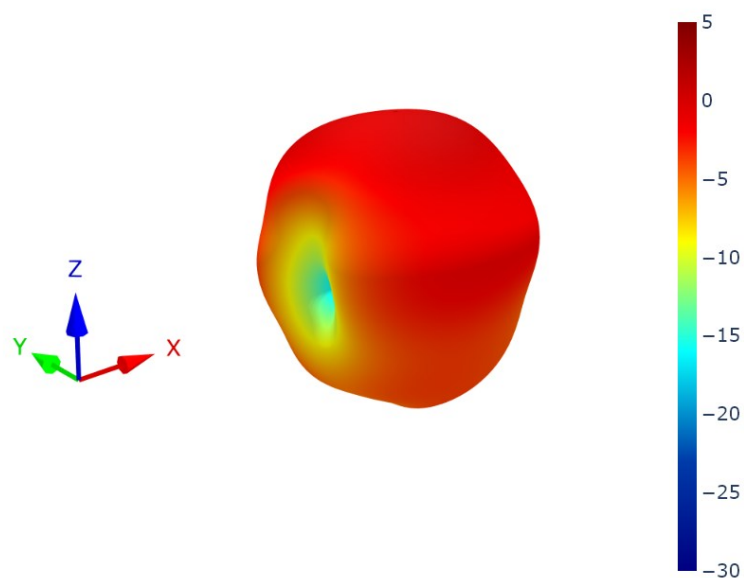
YZ Plane



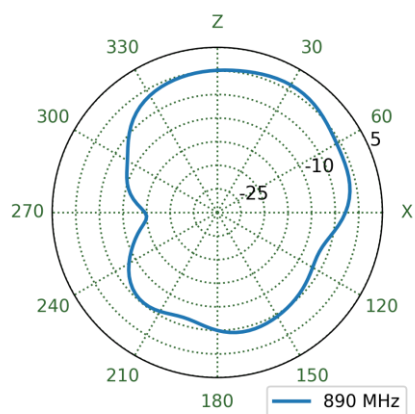
XY Plane



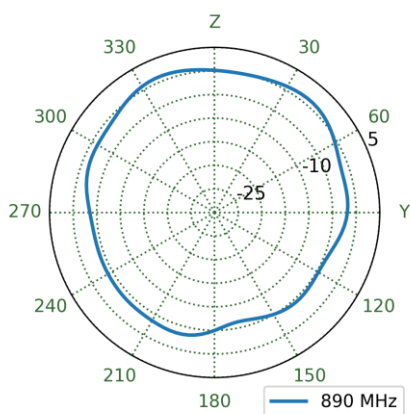
7.10 MIMO1 Cellular Free Space Patterns at 890 MHz



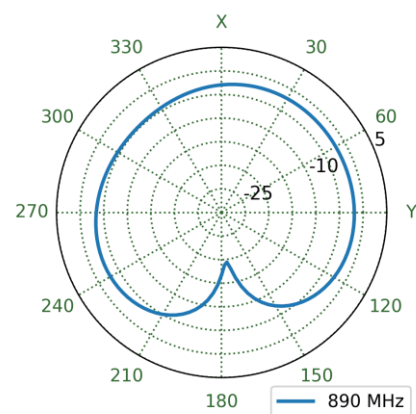
XZ Plane



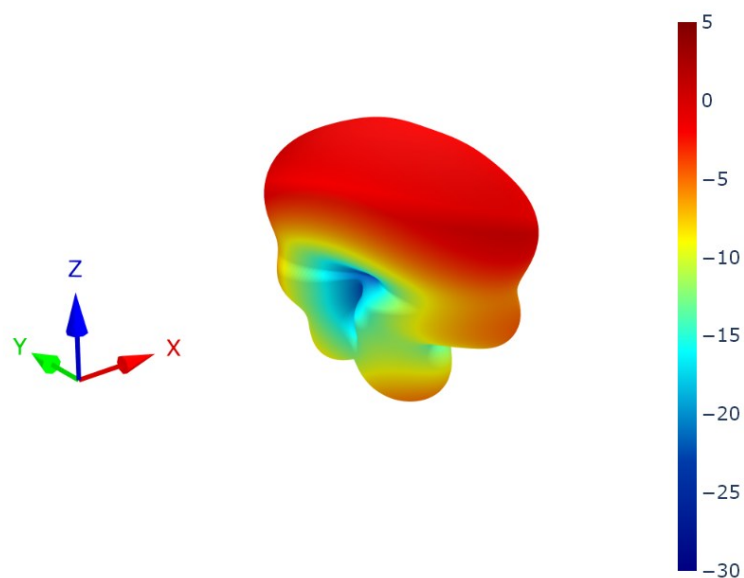
YZ Plane



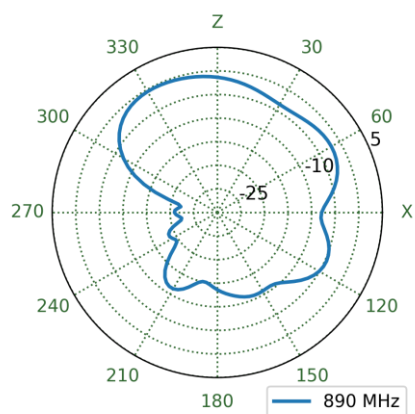
XY Plane



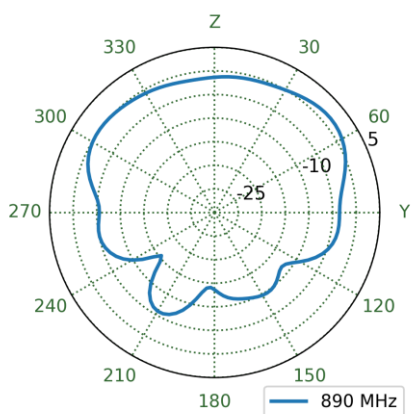
7.11 MIMO1 Cellular Gound Plane Patterns at 890 MHz



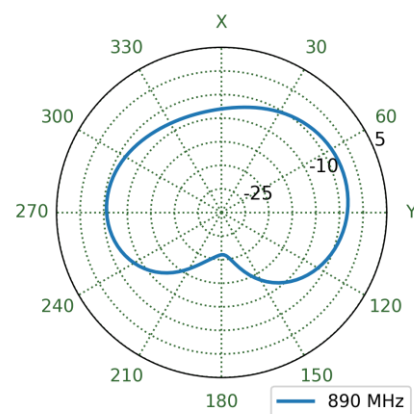
XZ Plane



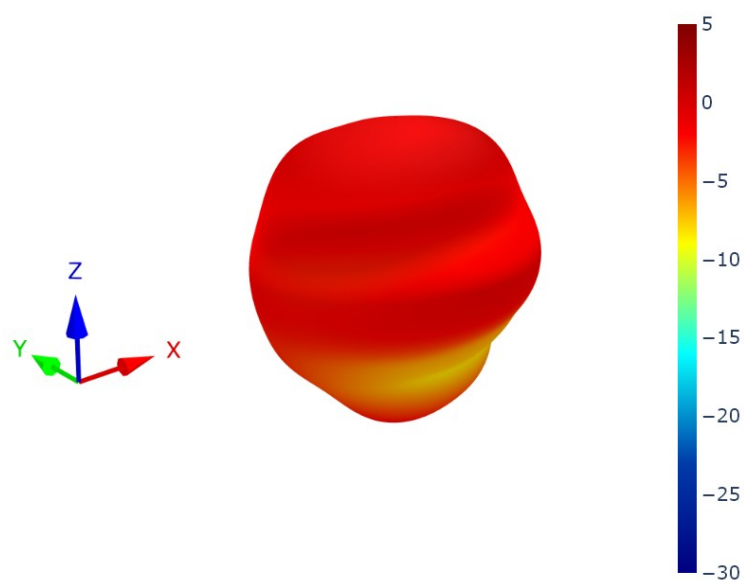
YZ Plane



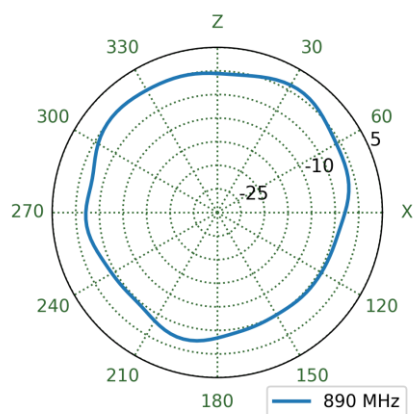
XY Plane



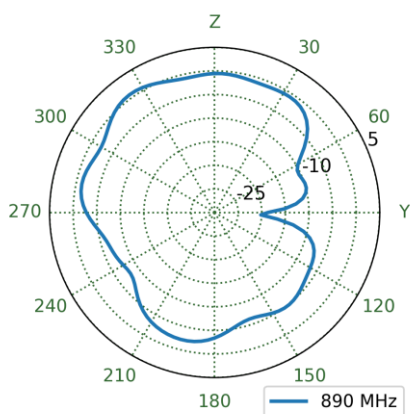
7.12 MIMO2 Cellular Free Space Patterns at 890 MHz



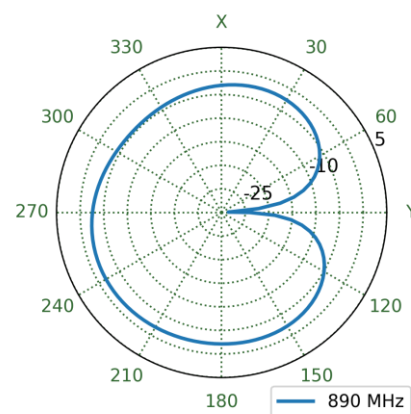
XZ Plane



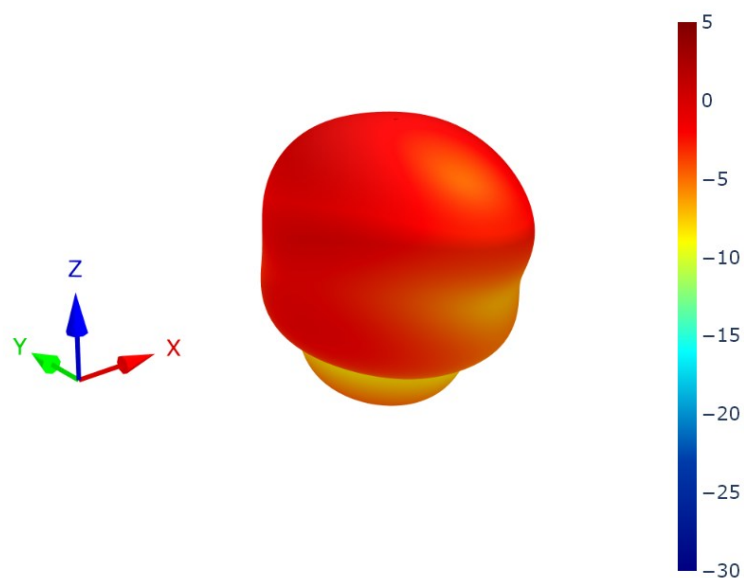
YZ Plane



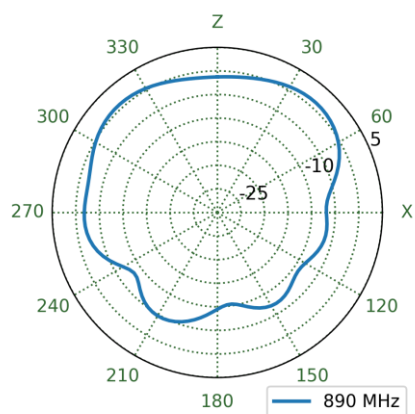
XY Plane



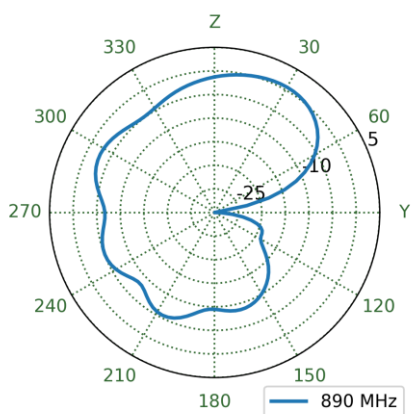
7.13 MIMO2 Cellular Ground Plane Patterns at 890 MHz



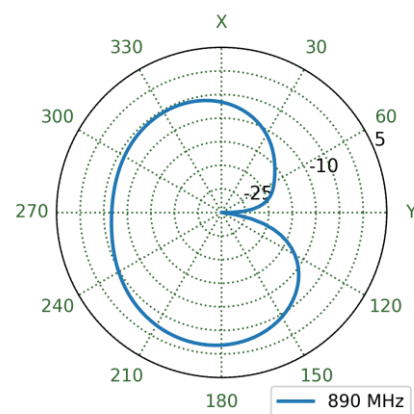
XZ Plane



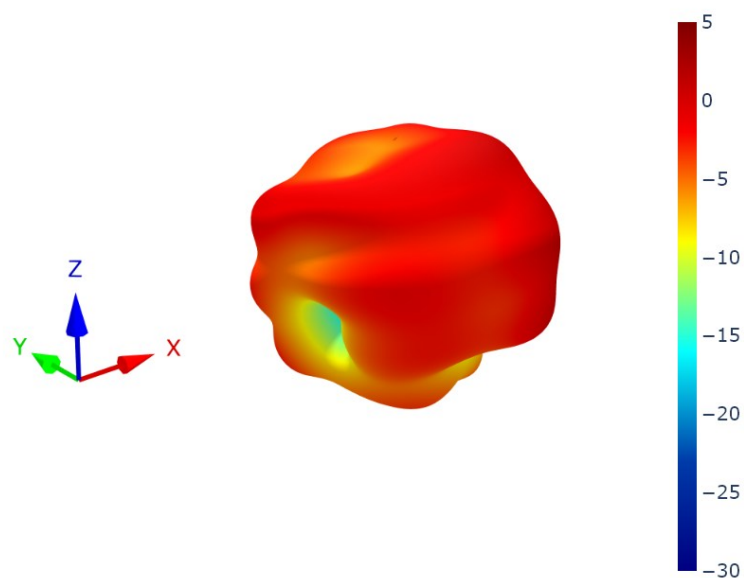
YZ Plane



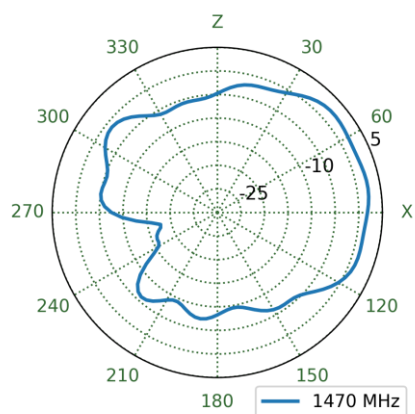
XY Plane



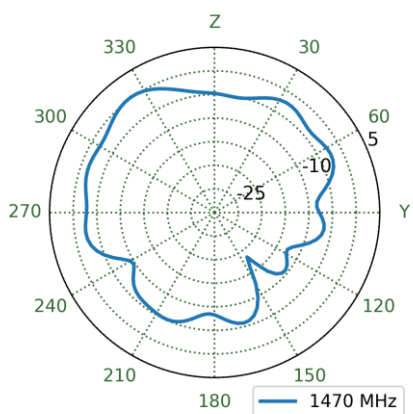
7.14 MIMO1 Cellular Free Space Patterns at 1470 MHz



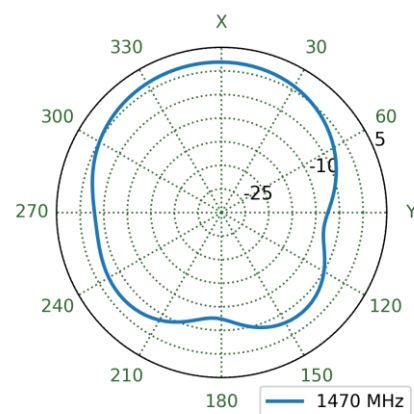
XZ Plane



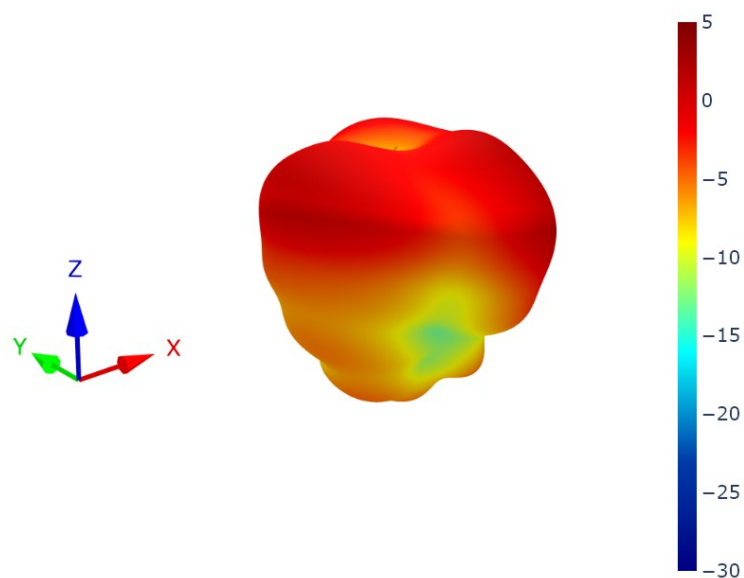
YZ Plane



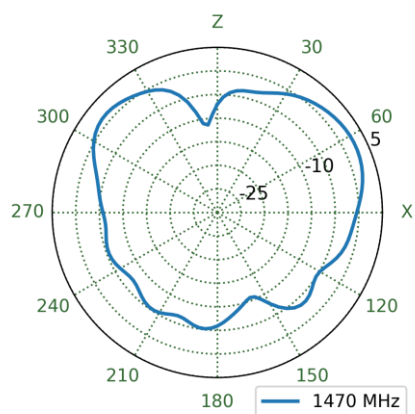
XY Plane



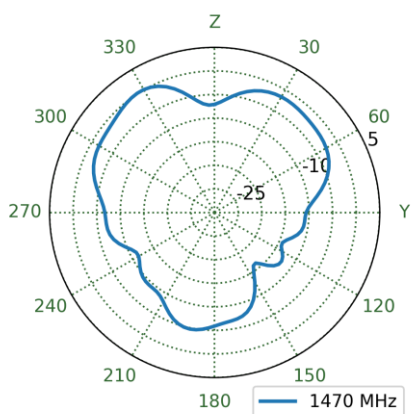
7.15 MIMO1 Cellular Gound Plane Patterns at 1470 MHz



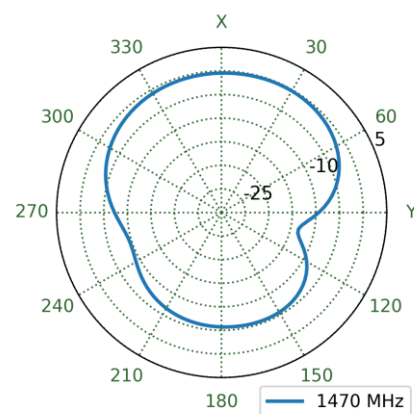
XZ Plane



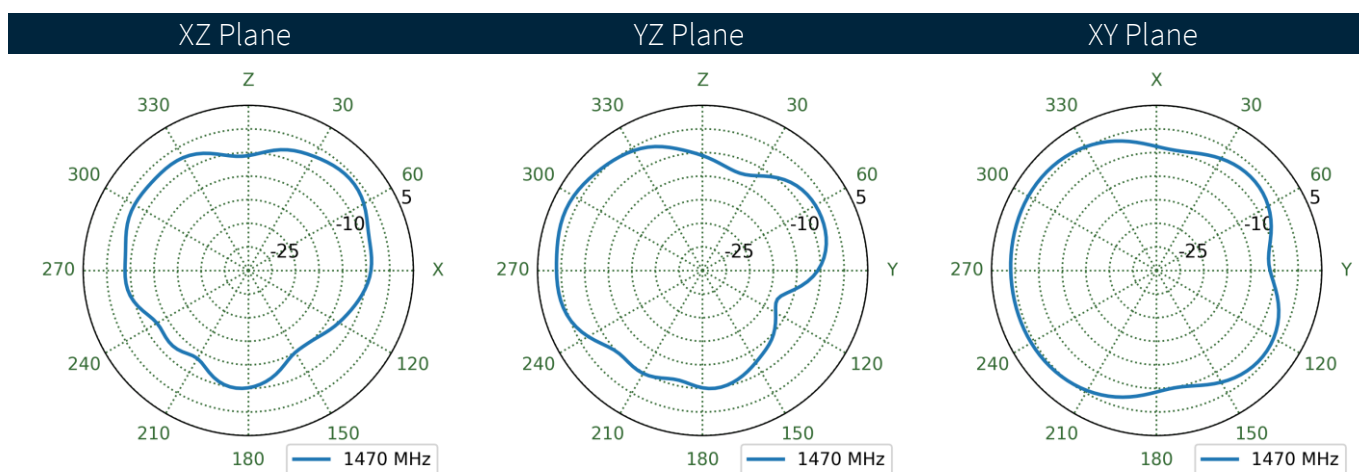
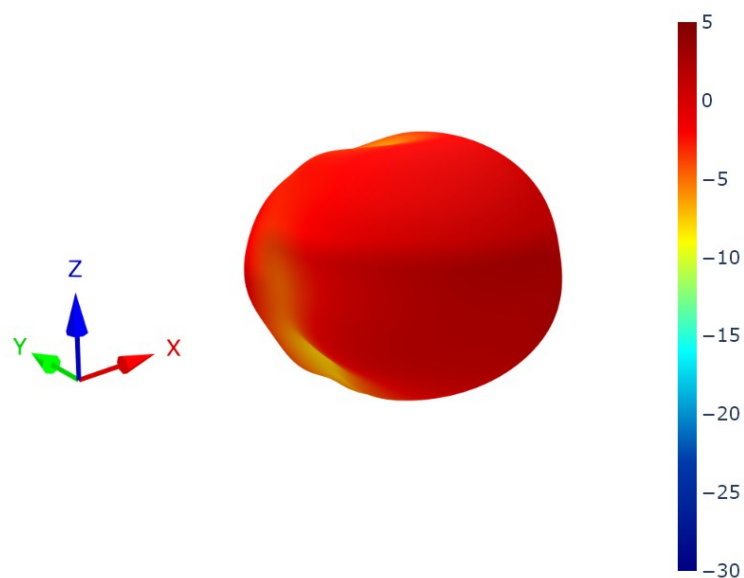
YZ Plane



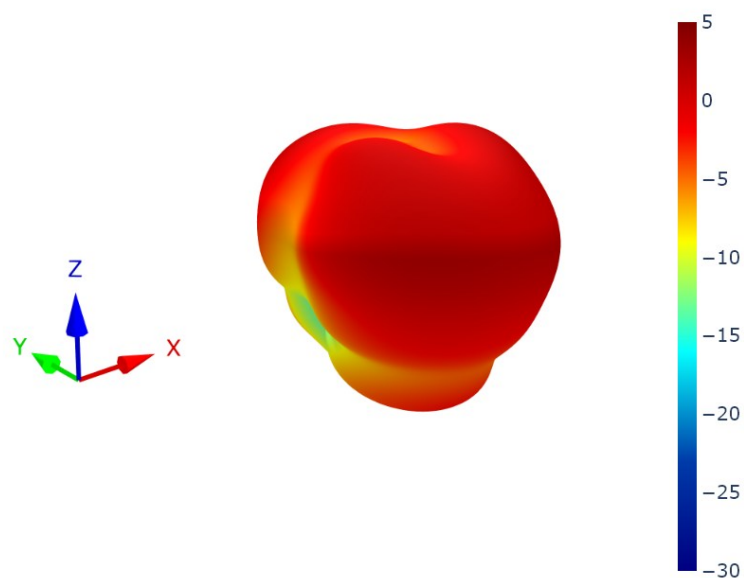
XY Plane



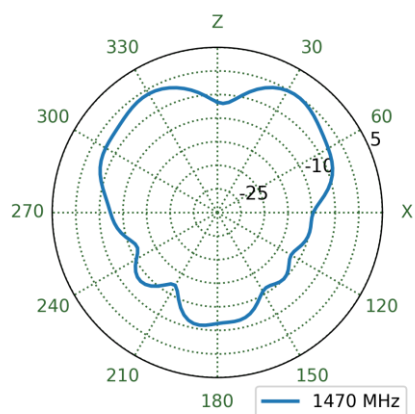
7.16 MIMO2 Cellular Free Space Patterns at 1470 MHz



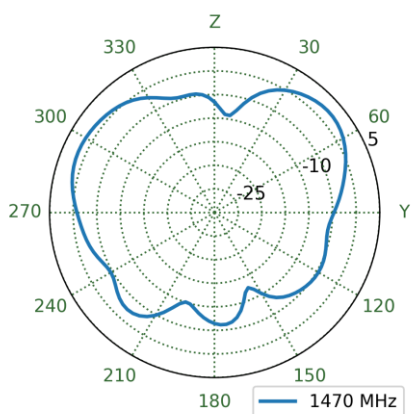
7.17 MIMO2 Cellular Ground Plane Patterns at 1470 MHz



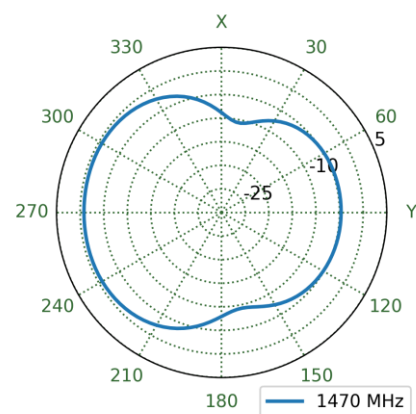
XZ Plane



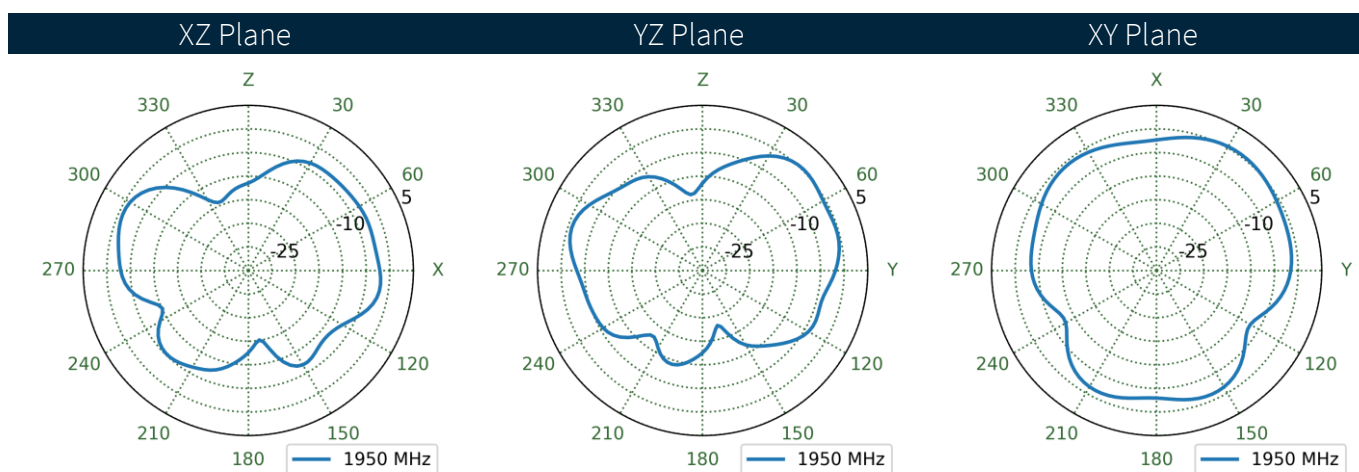
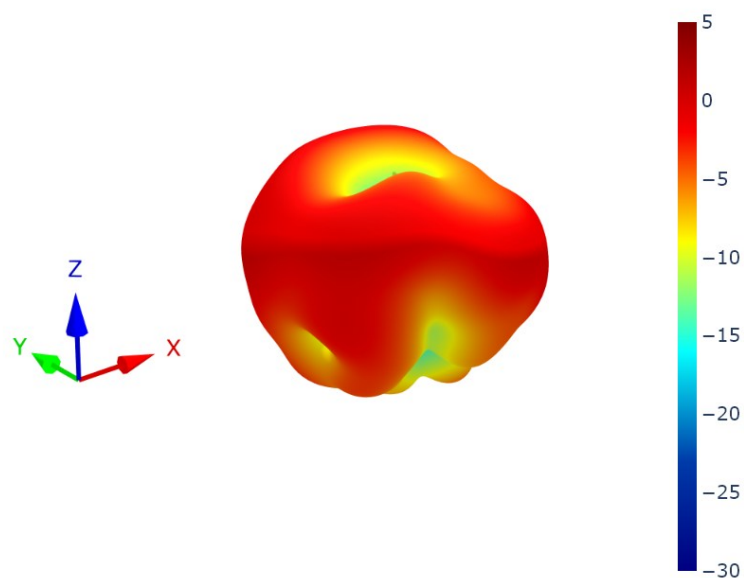
YZ Plane



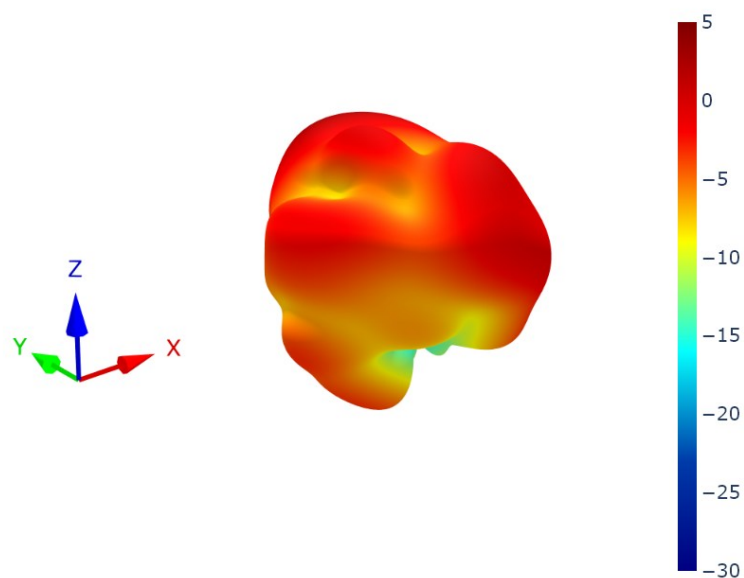
XY Plane



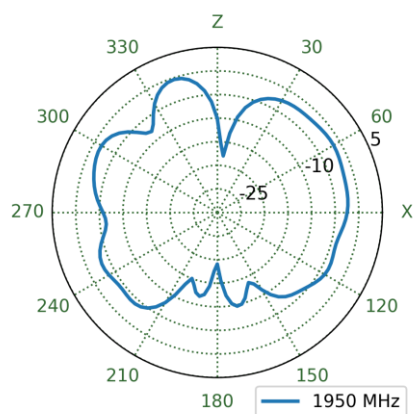
7.18 MIMO1 Cellular Free Space Patterns at 1950 MHz



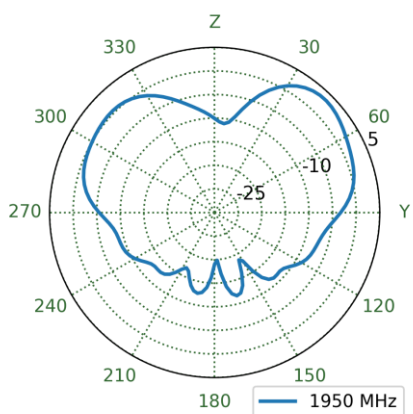
7.19 MIMO1 Cellular Gound Plane Patterns at 1950 MHz



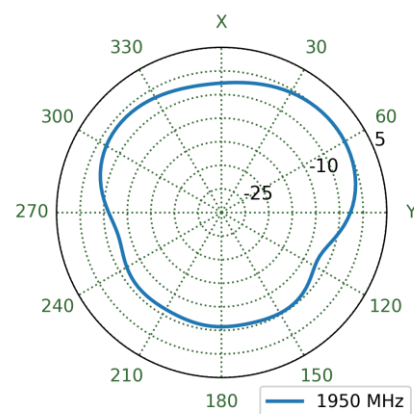
XZ Plane



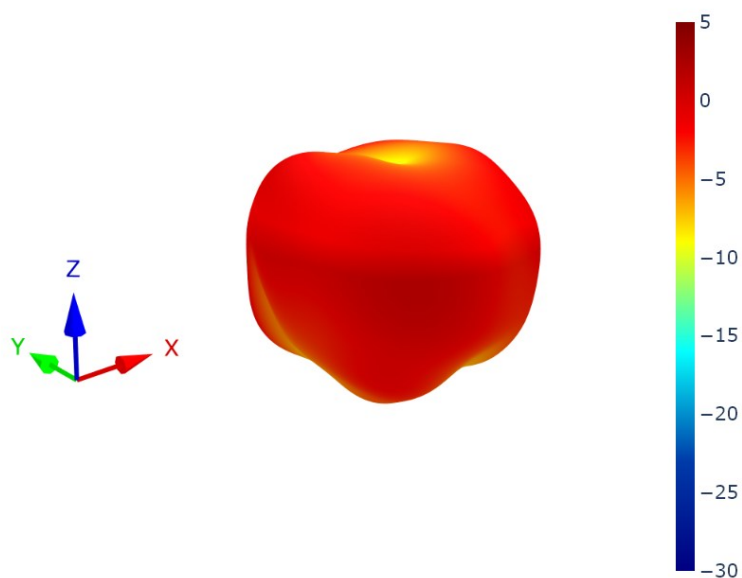
YZ Plane



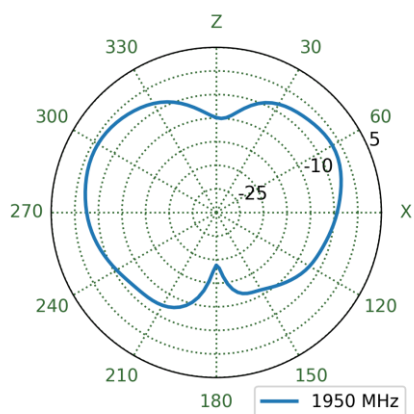
XY Plane



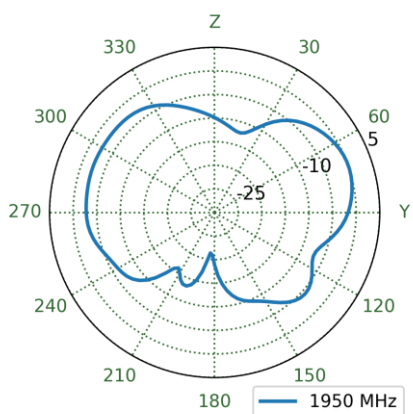
7.20 MIMO2 Cellular Free Space Patterns at 1950 MHz



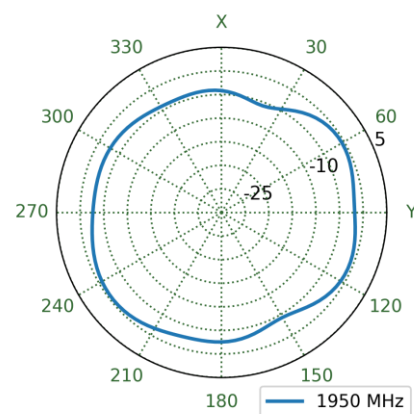
XZ Plane



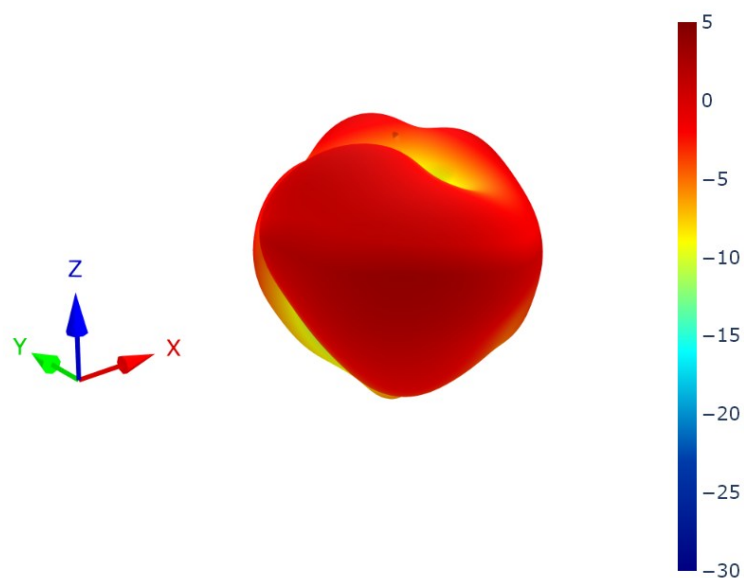
YZ Plane



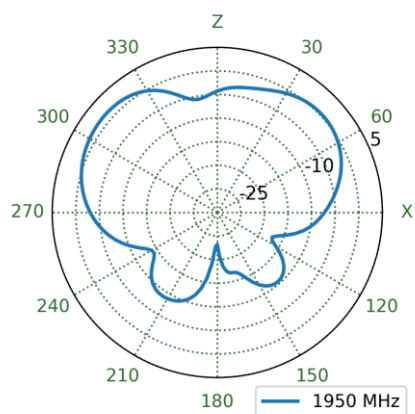
XY Plane



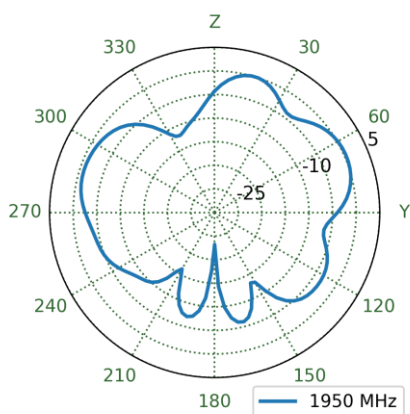
7.21 MIMO2 Cellular Ground Plane Patterns at 1950 MHz



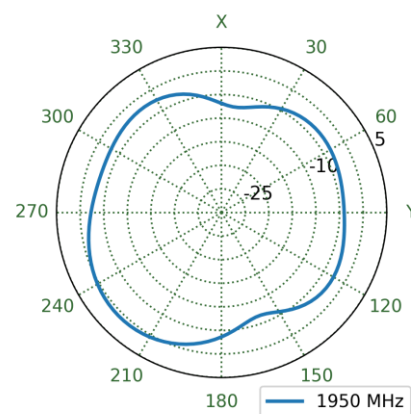
XZ Plane



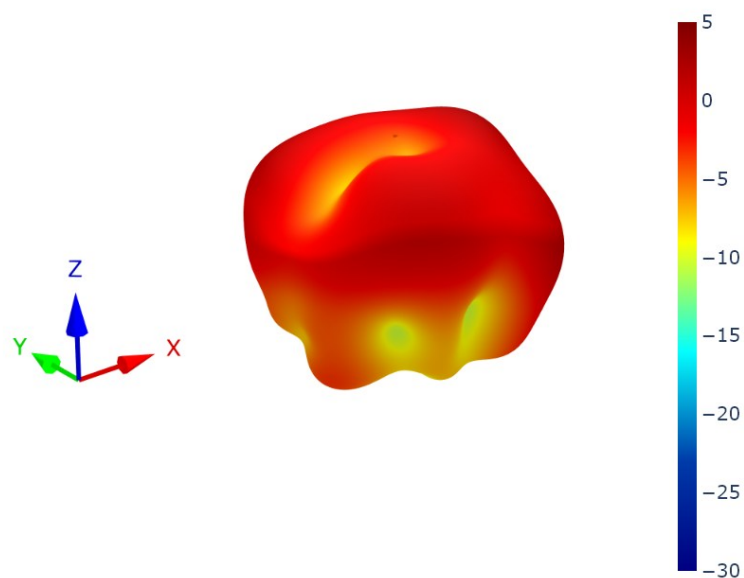
YZ Plane



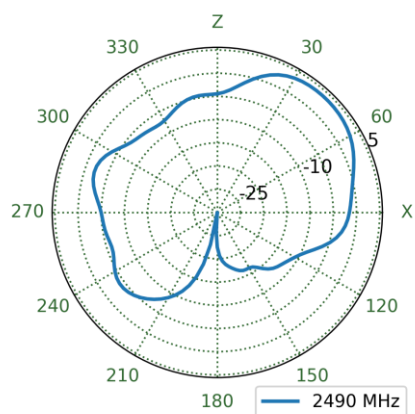
XY Plane



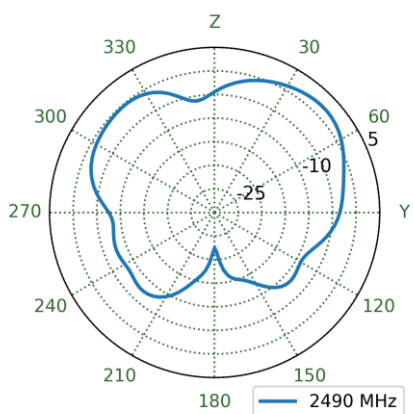
7.22 MIMO1 Cellular Free Space Patterns at 2490 MHz



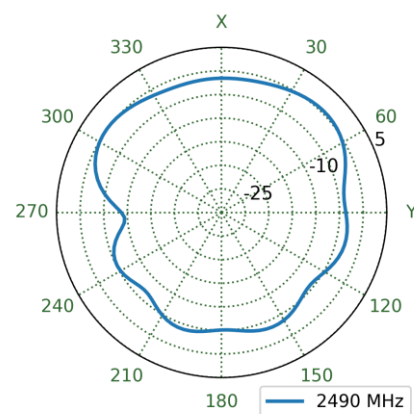
XZ Plane



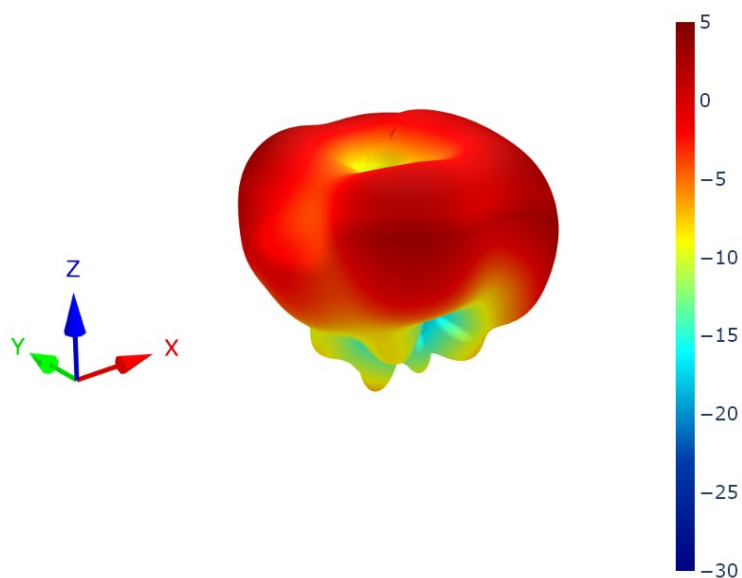
YZ Plane



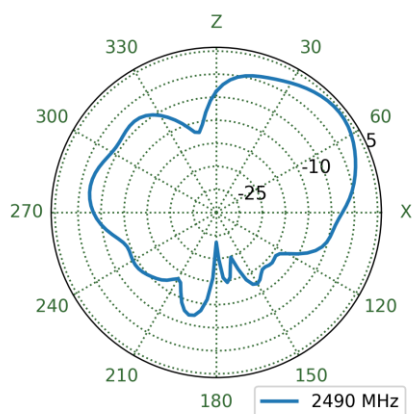
XY Plane



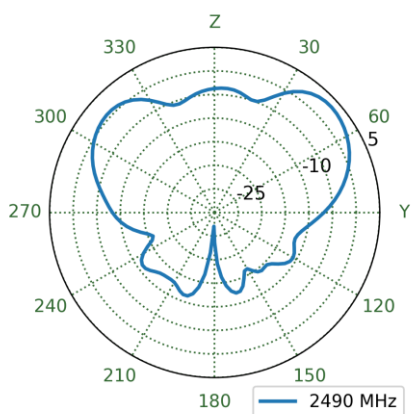
7.23 MIMO1 Cellular Gound Plane Patterns at 2490 MHz



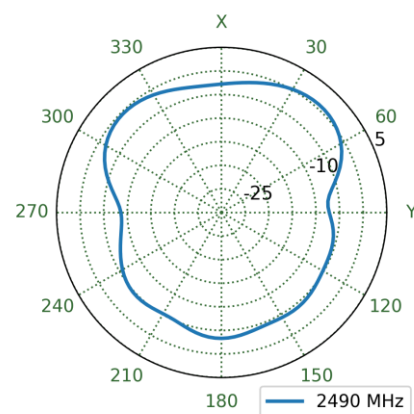
XZ Plane



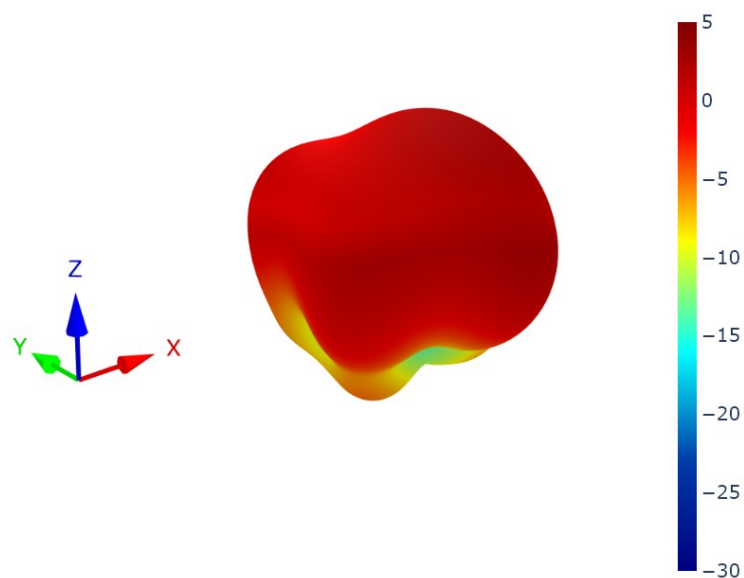
YZ Plane



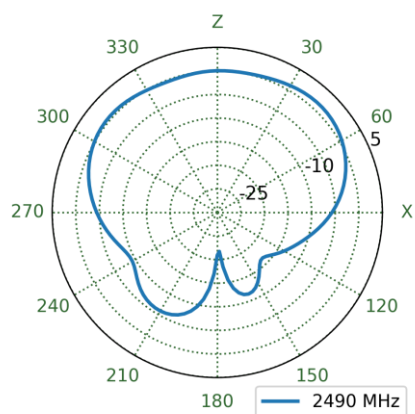
XY Plane



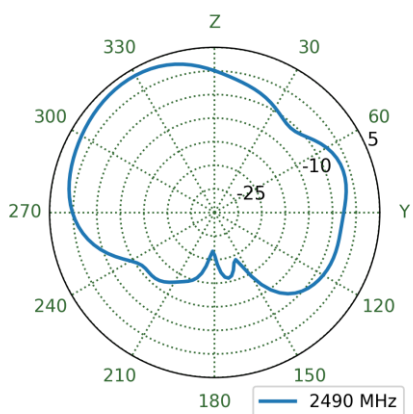
7.24 MIMO2 Cellular Free Space Patterns at 2490 MHz



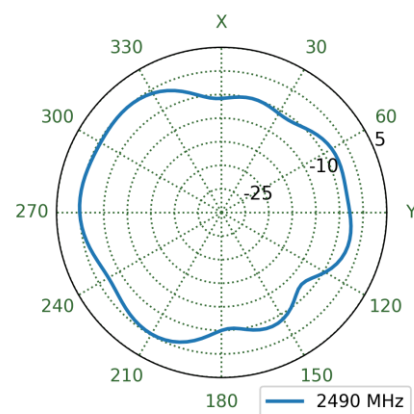
XZ Plane



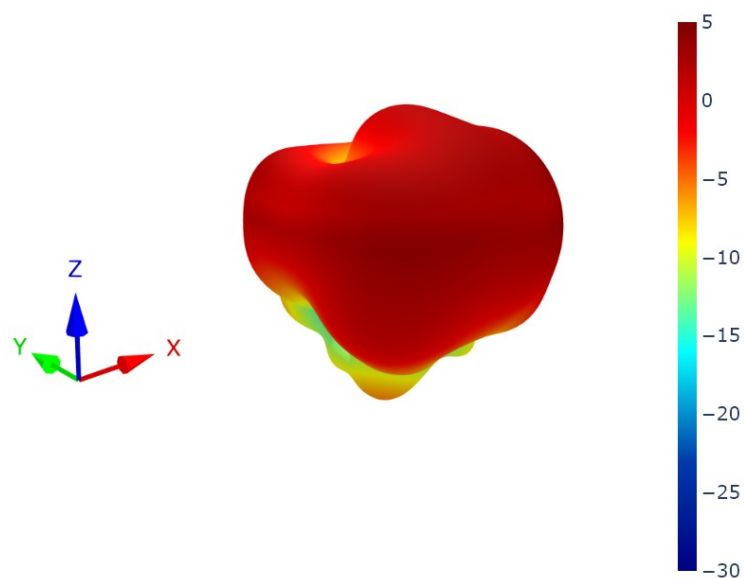
YZ Plane



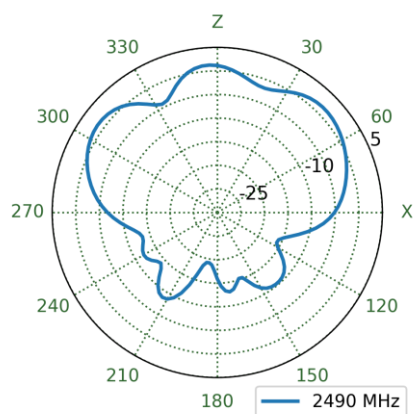
XY Plane



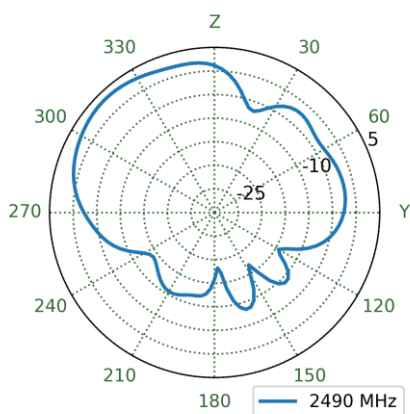
7.25 MIMO2 Cellular Ground Plane Patterns at 2490 MHz



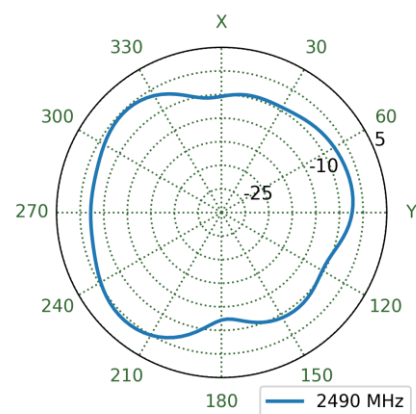
XZ Plane



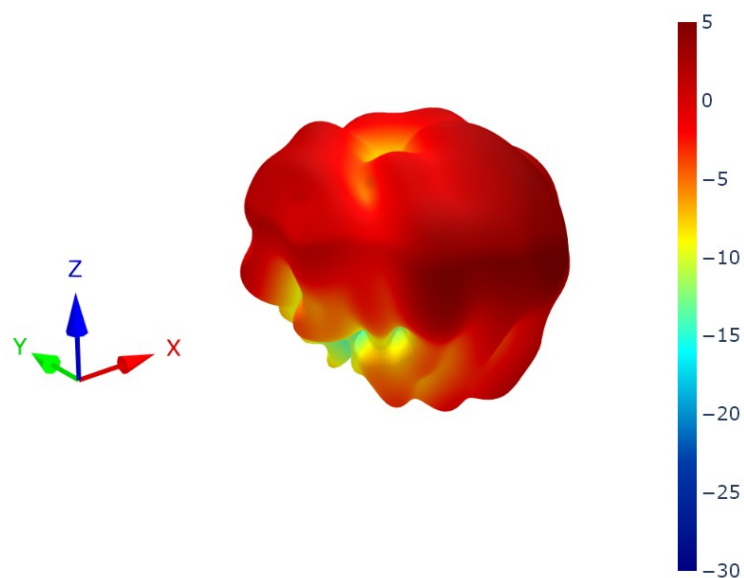
YZ Plane



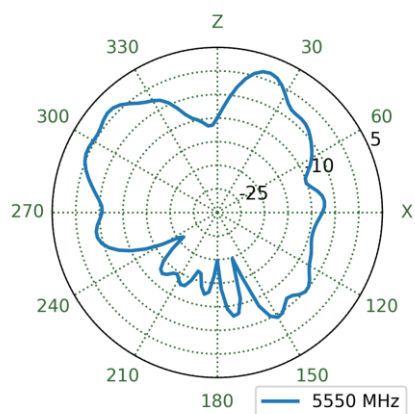
XY Plane



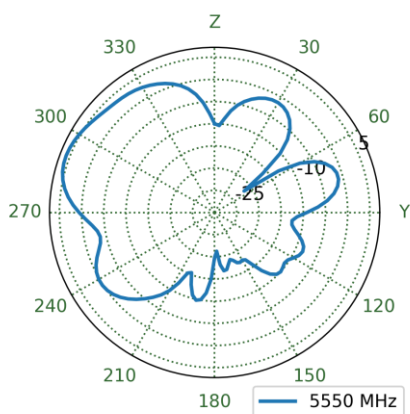
7.26 MIMO1 Cellular Free Space Patterns at 5550 MHz



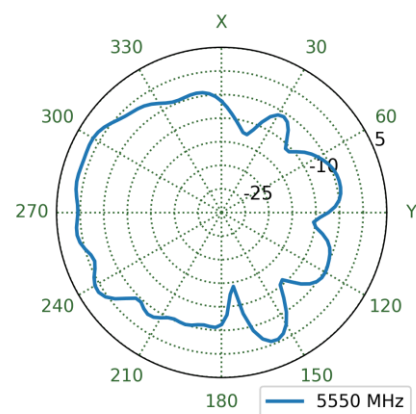
XZ Plane



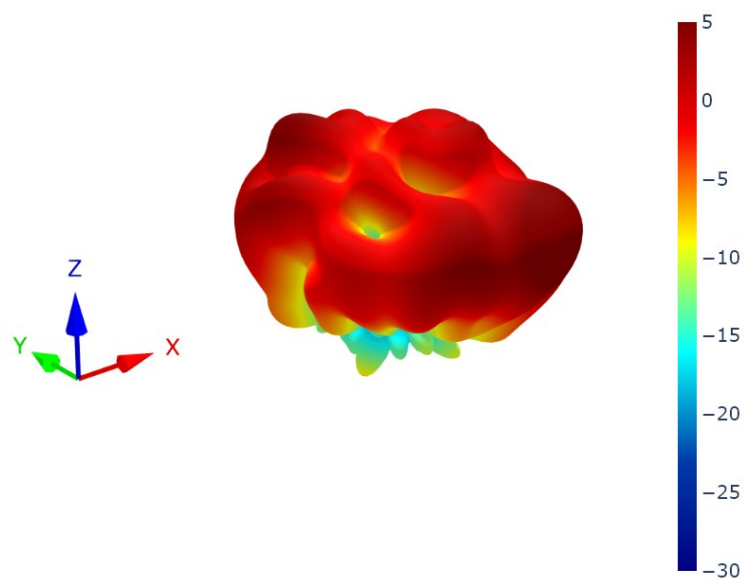
YZ Plane



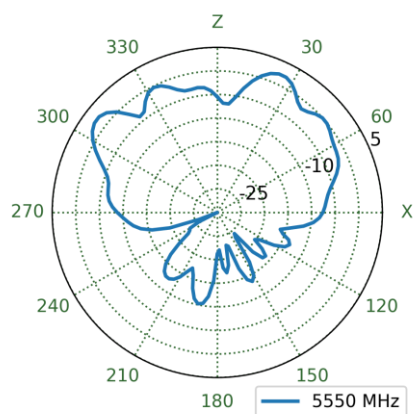
XY Plane



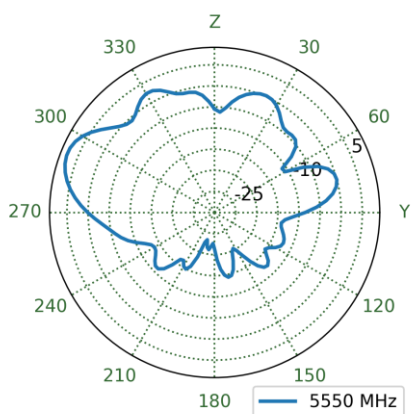
7.27 MIMO1 Cellular Gound Plane Patterns at 5550 MHz



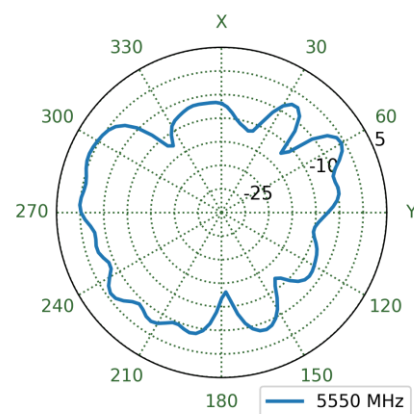
XZ Plane



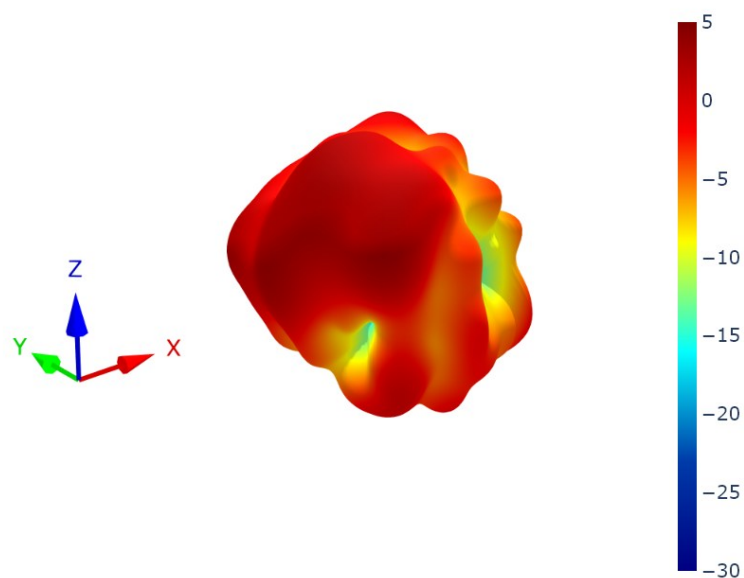
YZ Plane



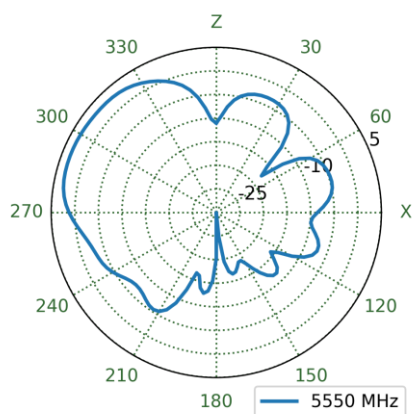
XY Plane



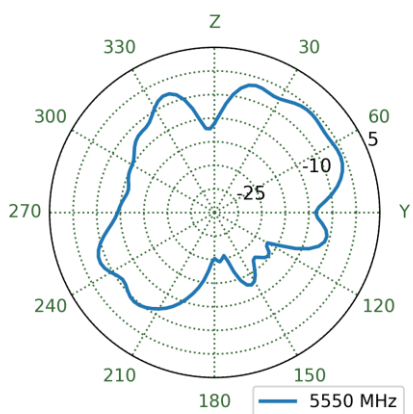
7.28 MIMO2 Cellular Free Space Patterns at 5550 MHz



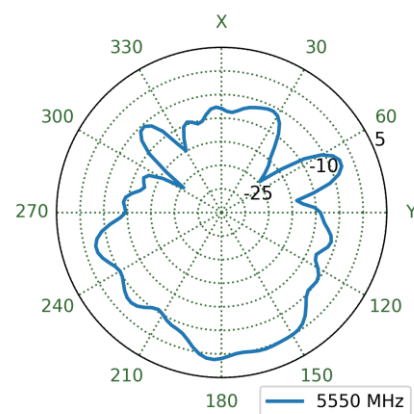
XZ Plane



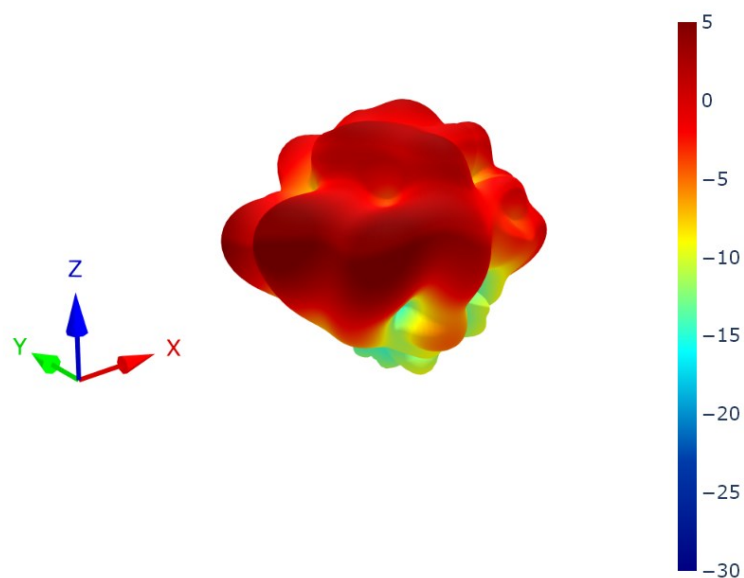
YZ Plane



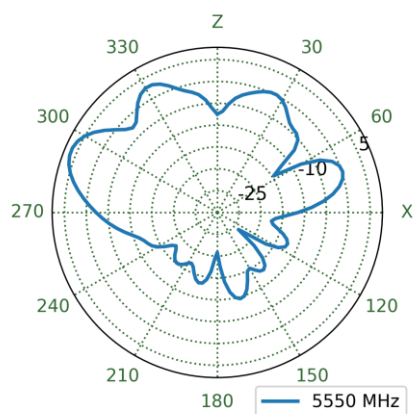
XY Plane



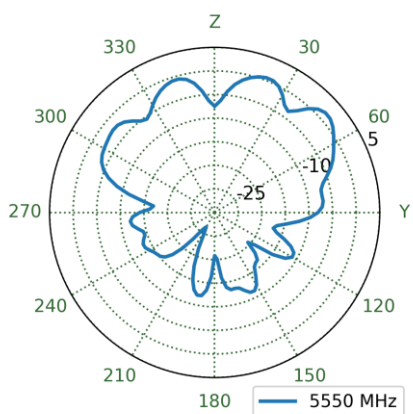
7.29 MIMO2 Cellular Ground Plane Patterns at 5550 MHz



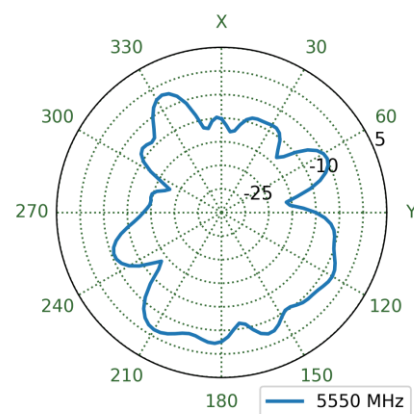
XZ Plane



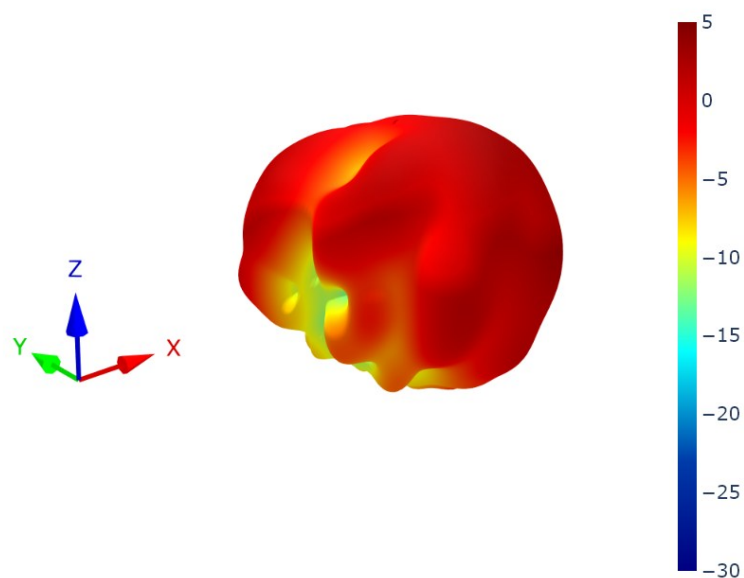
YZ Plane



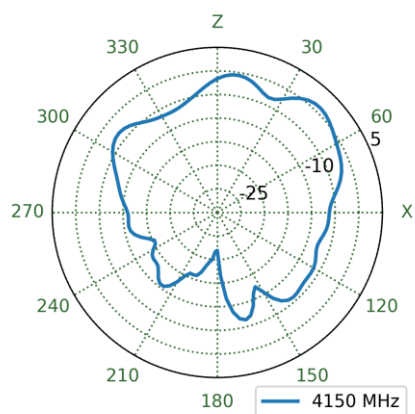
XY Plane



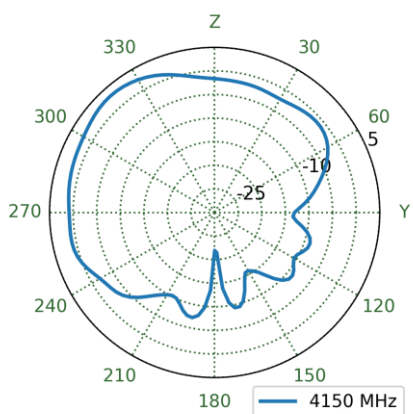
7.30 MIMO1 Cellular Free Space Patterns at 4150 MHz



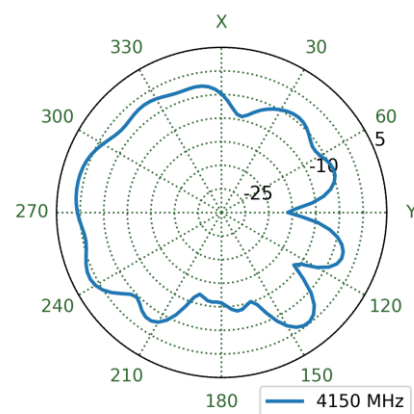
XZ Plane



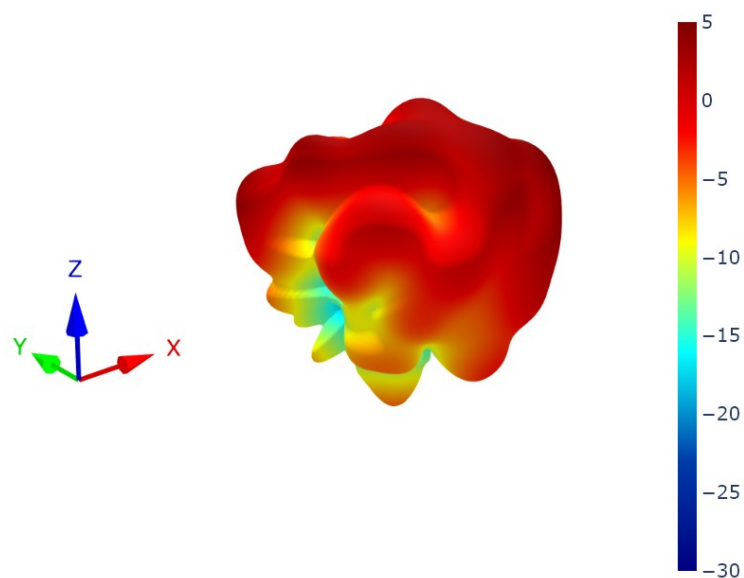
YZ Plane



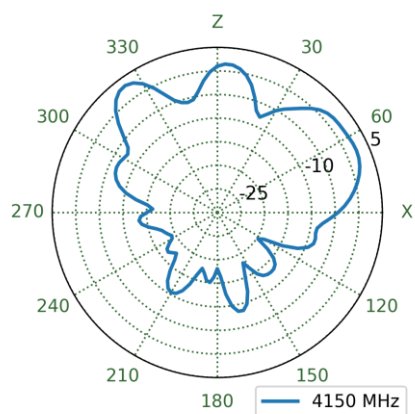
XY Plane



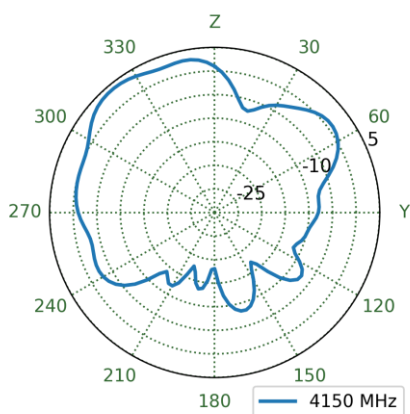
7.31 MIMO1 Cellular Gound Plane Patterns at 4150 MHz



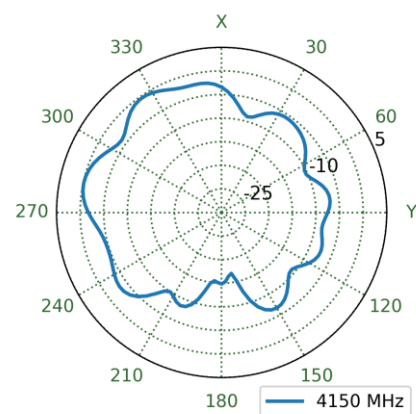
XZ Plane



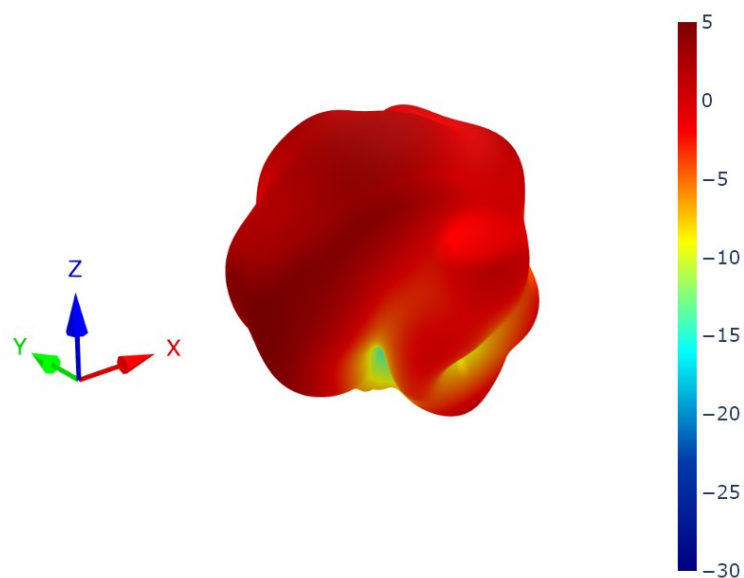
YZ Plane



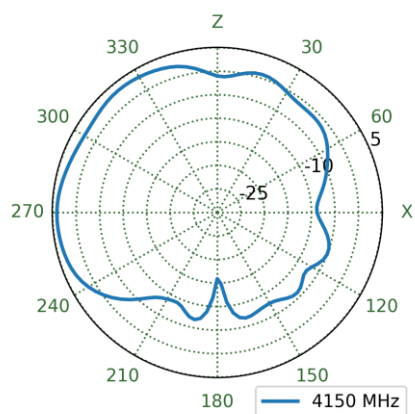
XY Plane



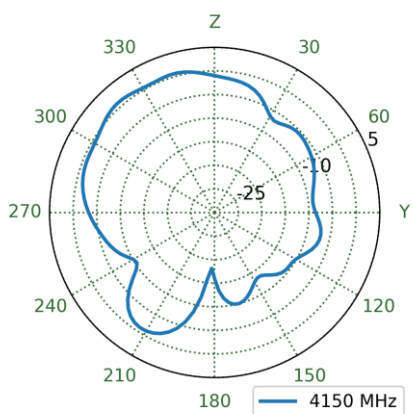
7.32 MIMO2 Cellular Free Space Patterns at 4150 MHz



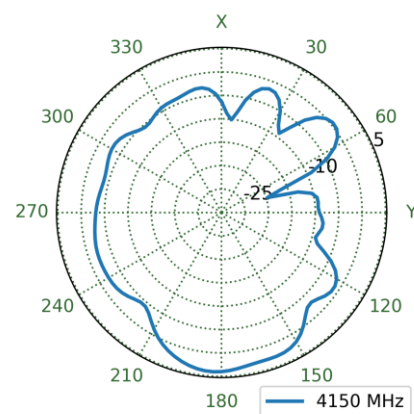
XZ Plane



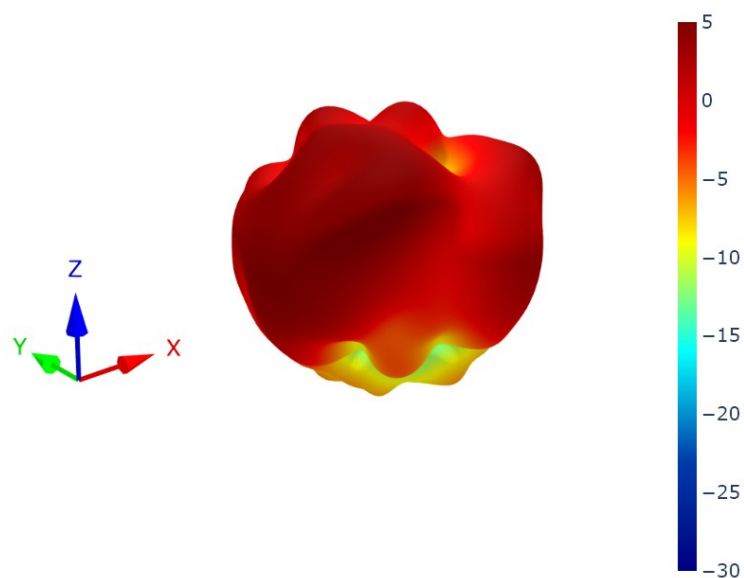
YZ Plane



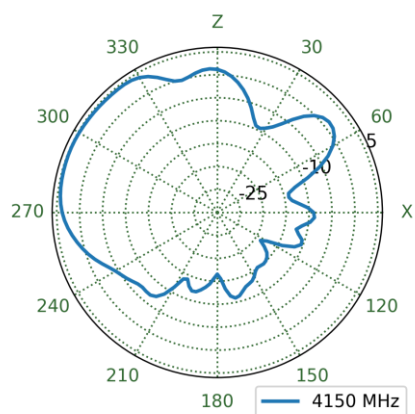
XY Plane



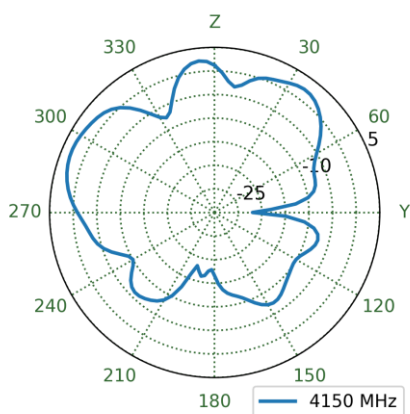
7.33 MIMO2 Cellular Ground Plane Patterns at 4150 MHz



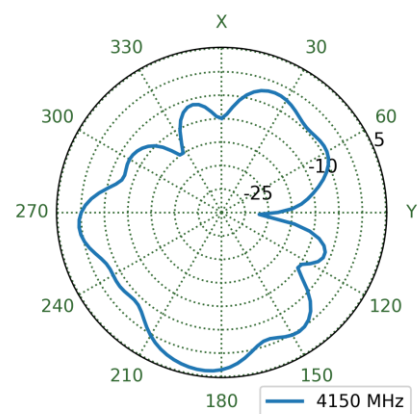
XZ Plane



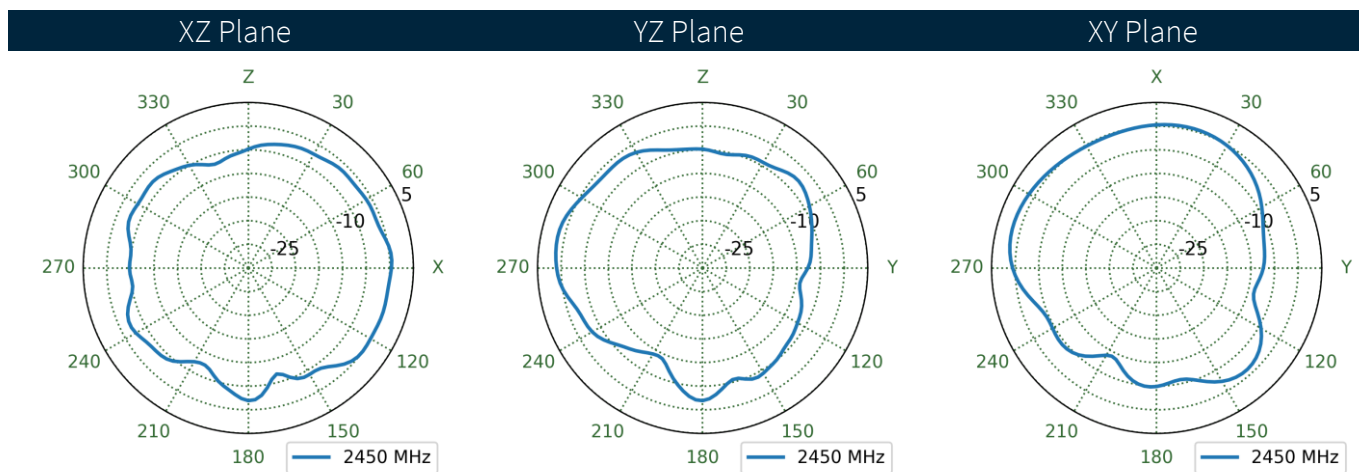
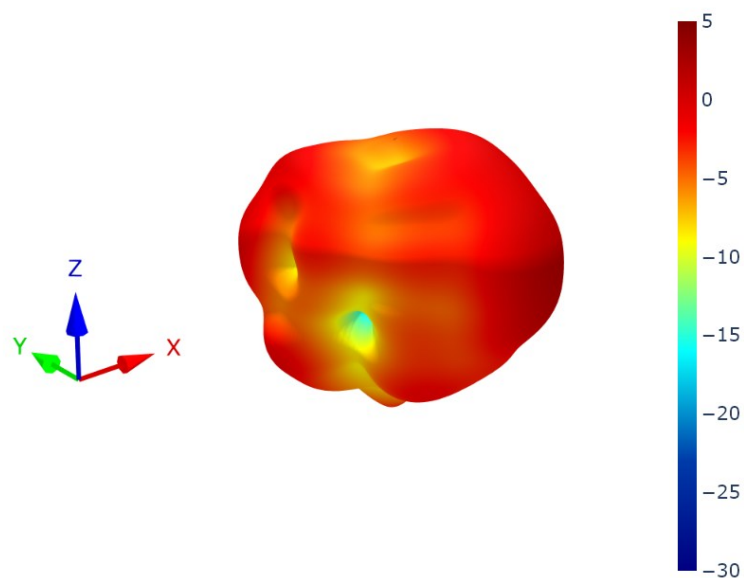
YZ Plane



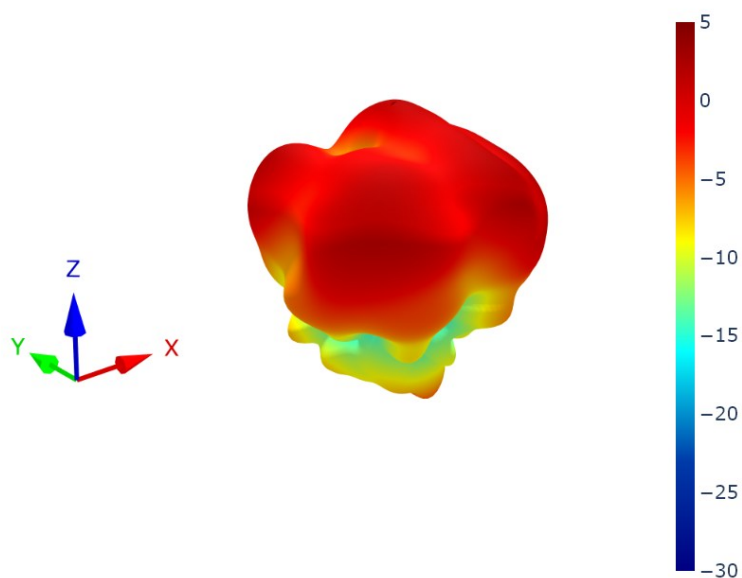
XY Plane



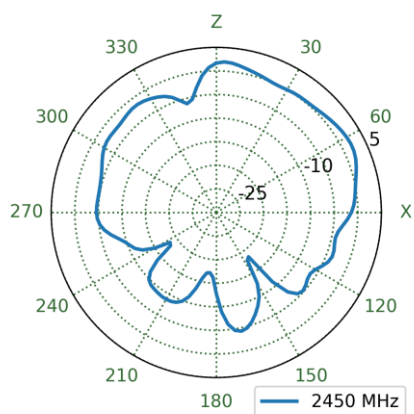
7.34 MIMO1 Wi-Fi Free Space Patterns at 2450 MHz



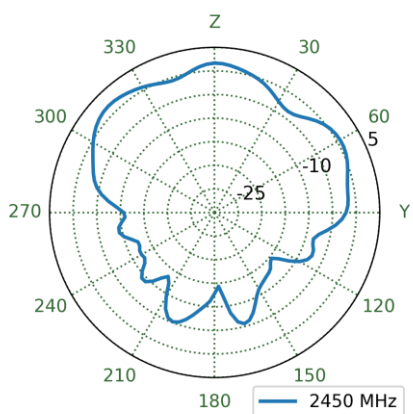
7.35 MIMO1 Wi-Fi Ground Plane Patterns at 2450 MHz



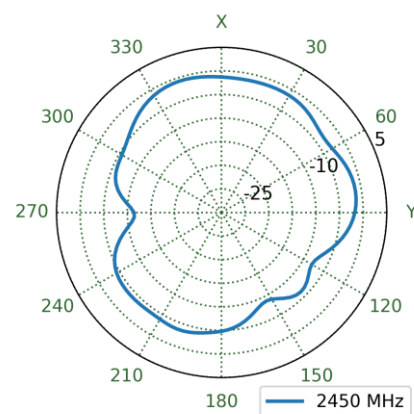
XZ Plane



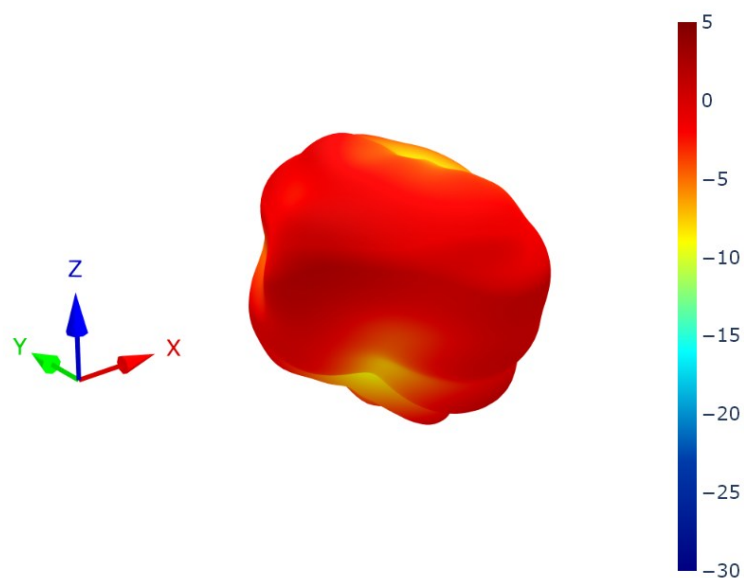
YZ Plane



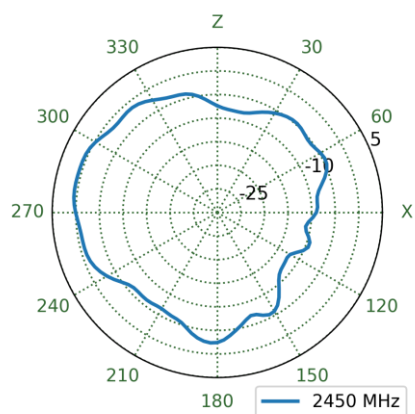
XY Plane



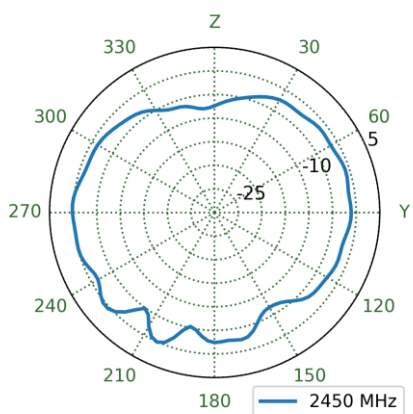
7.36 MIMO2 Wi-Fi Free Space Patterns at 2450 MHz



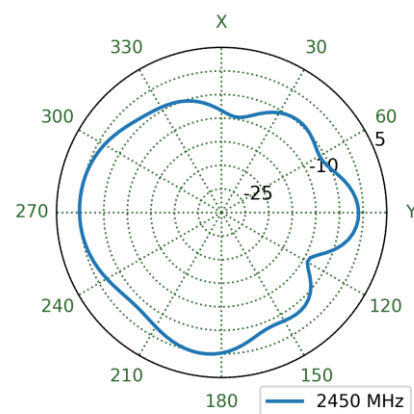
XZ Plane



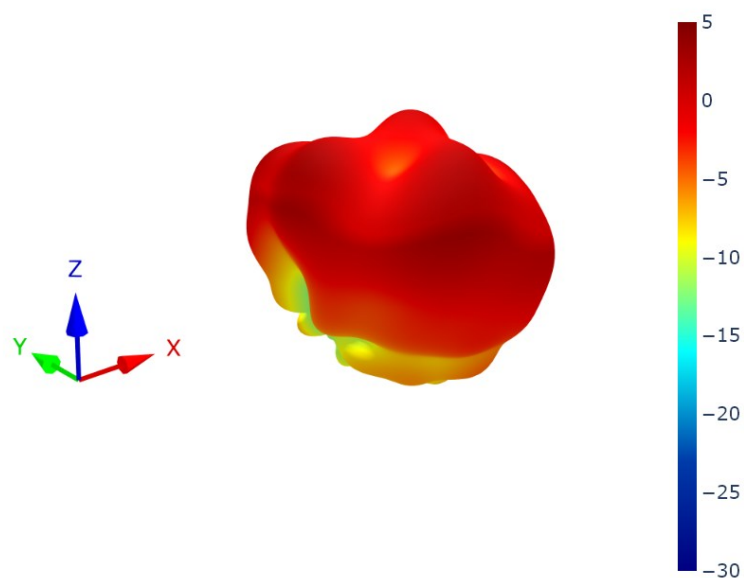
YZ Plane



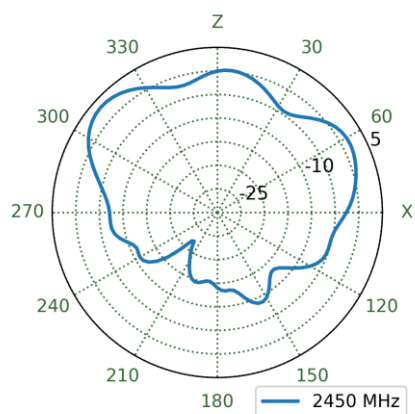
XY Plane



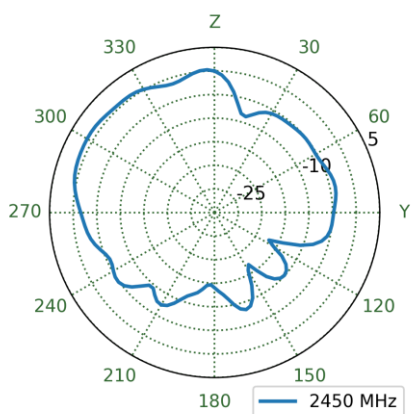
7.37 MIMO2 Wi-Fi Ground Plane Patterns at 2450 MHz



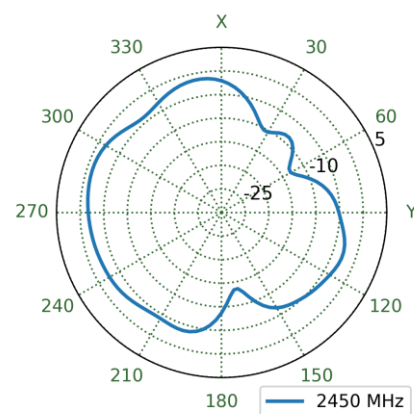
XZ Plane



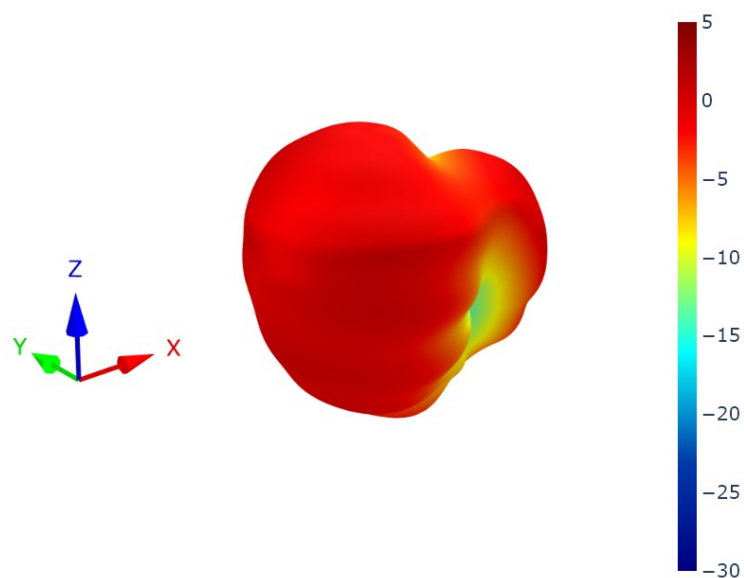
YZ Plane



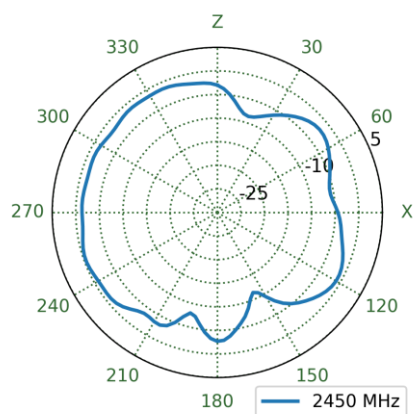
XY Plane



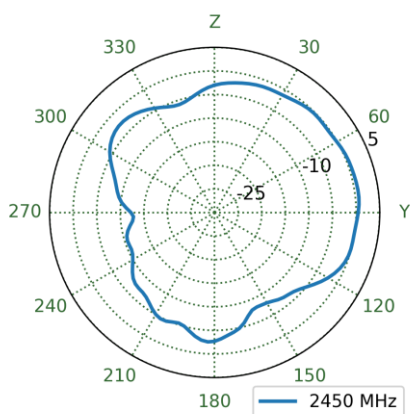
7.38 MIMO3 Wi-Fi Free Space Patterns at 2450 MHz



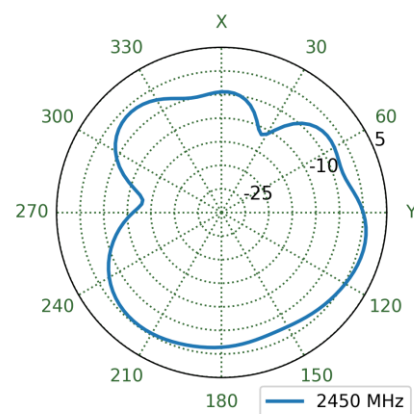
XZ Plane



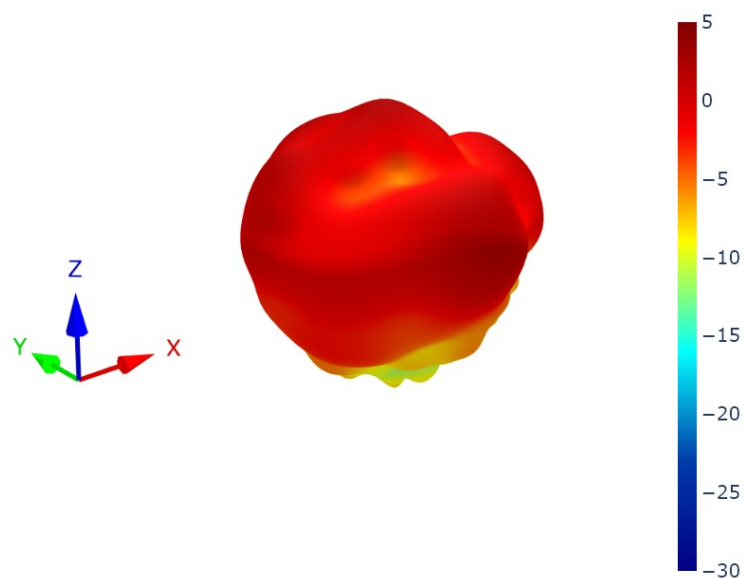
YZ Plane



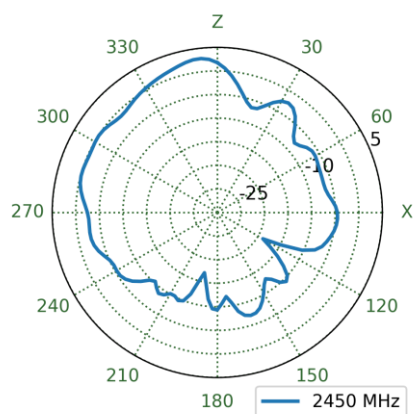
XY Plane



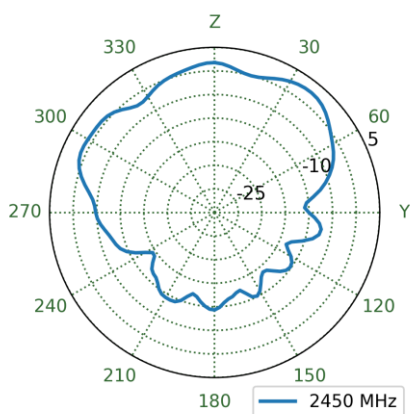
7.39 MIMO3 Wi-Fi Ground Plane Patterns at 2450 MHz



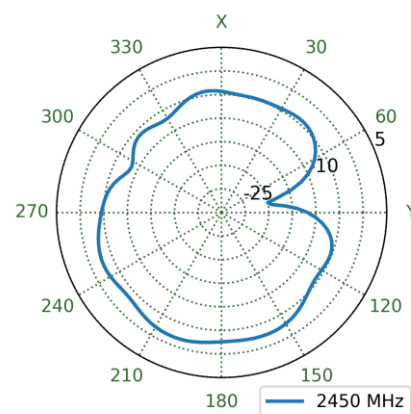
XZ Plane



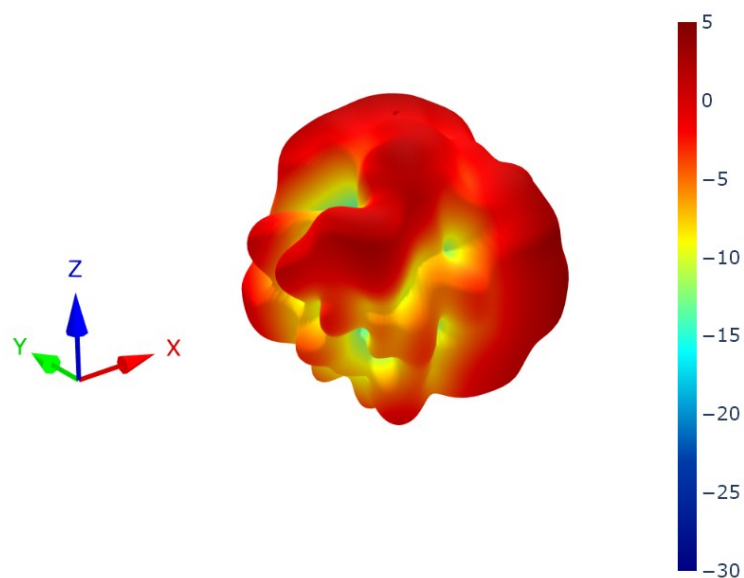
YZ Plane



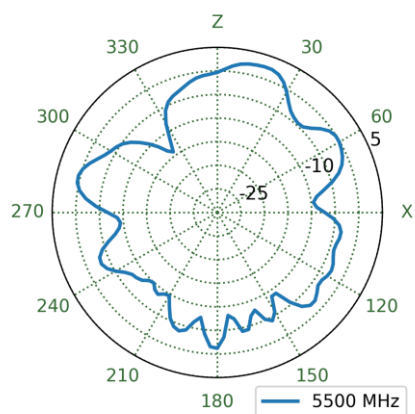
XY Plane



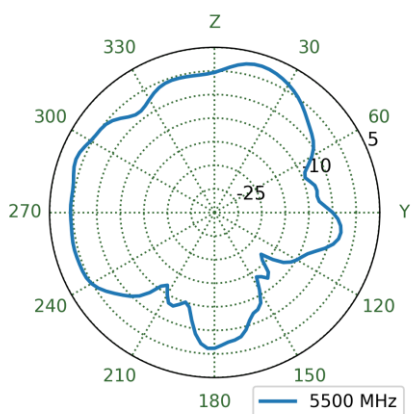
7.40 MIMO1 Wi-Fi Free Space Patterns at 5500 MHz



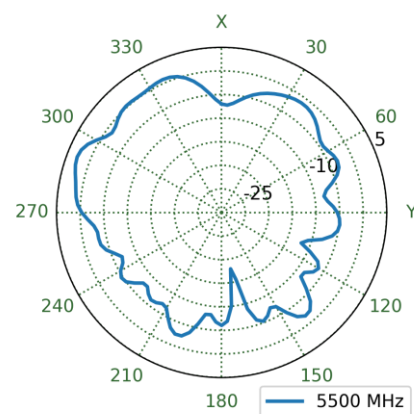
XZ Plane



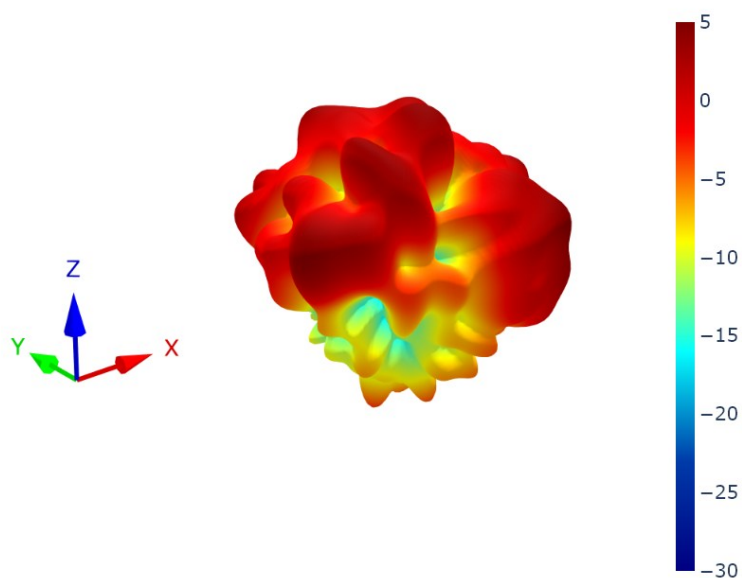
YZ Plane



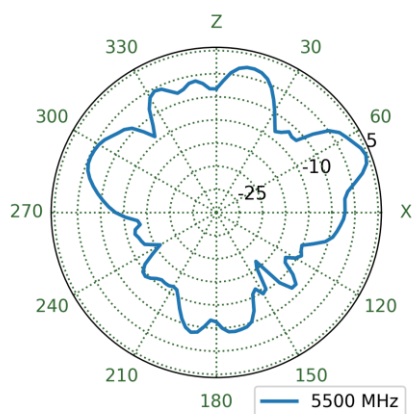
XY Plane



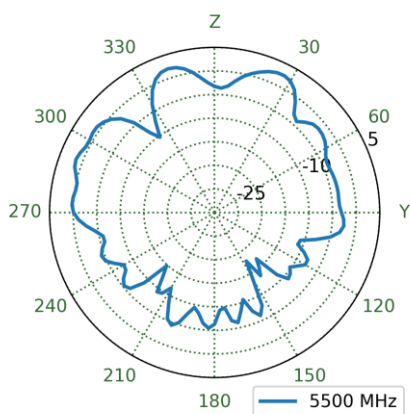
7.41 MIMO1 Wi-Fi Ground Plane Patterns at 5500 MHz



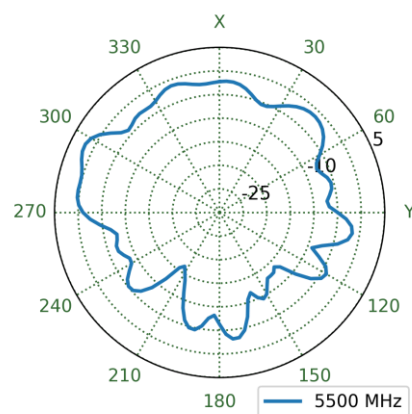
XZ Plane



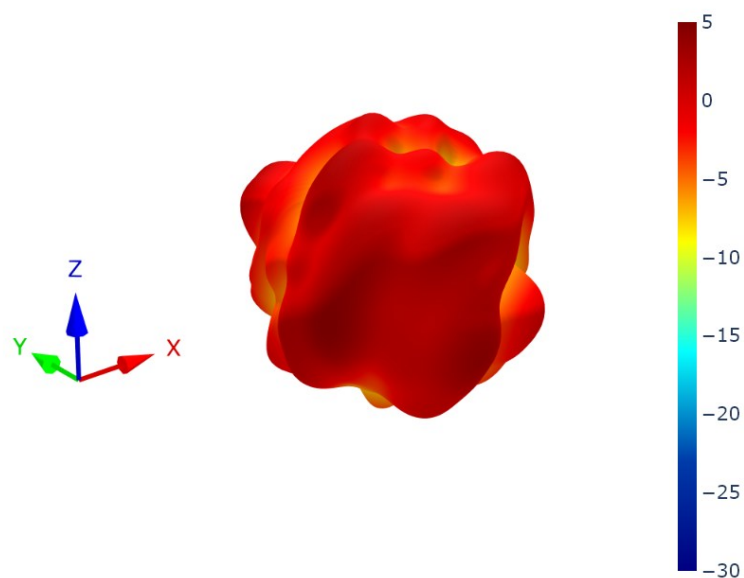
YZ Plane



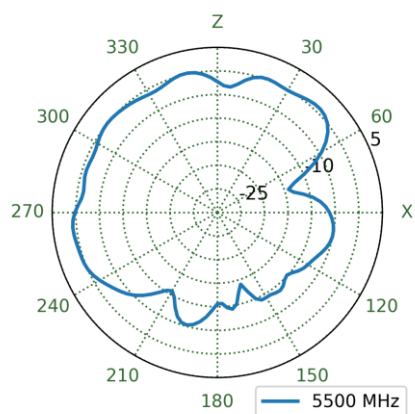
XY Plane



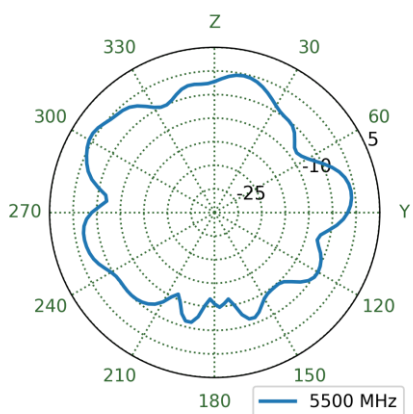
7.42 MIMO2 Wi-Fi Free Space Patterns at 5500 MHz



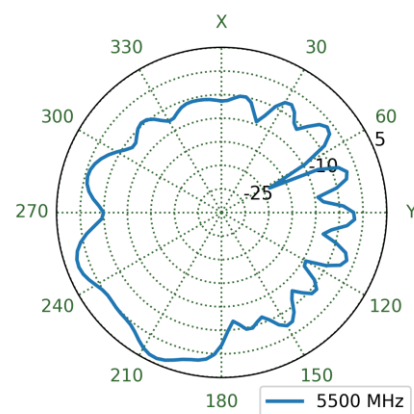
XZ Plane



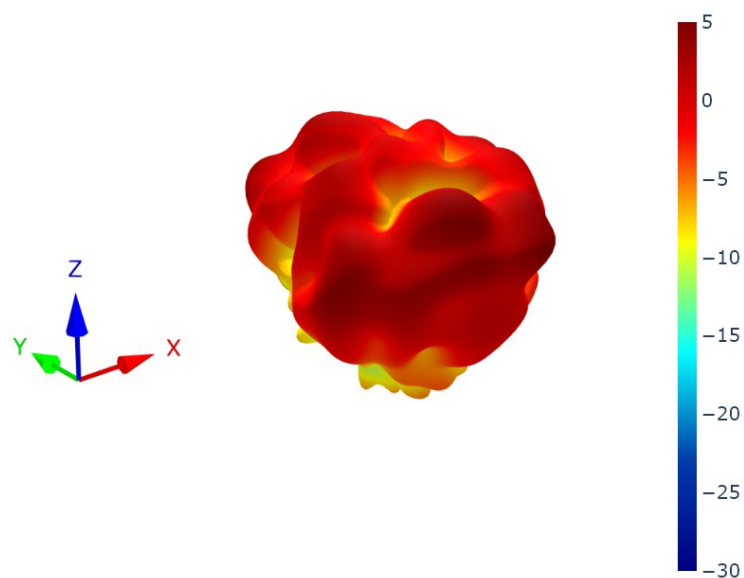
YZ Plane



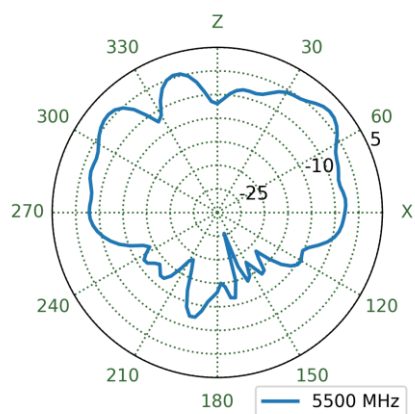
XY Plane



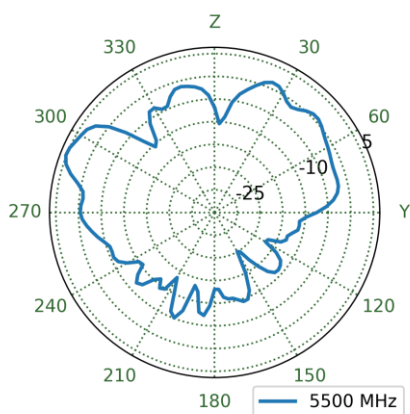
7.43 MIMO2 Wi-Fi Ground Plane Patterns at 5500 MHz



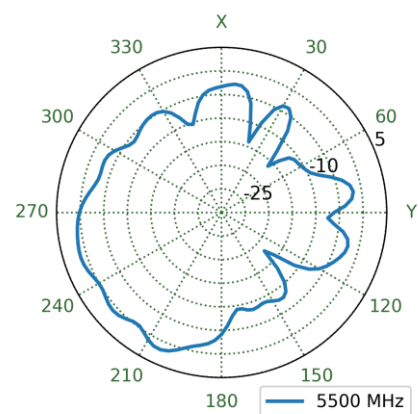
XZ Plane



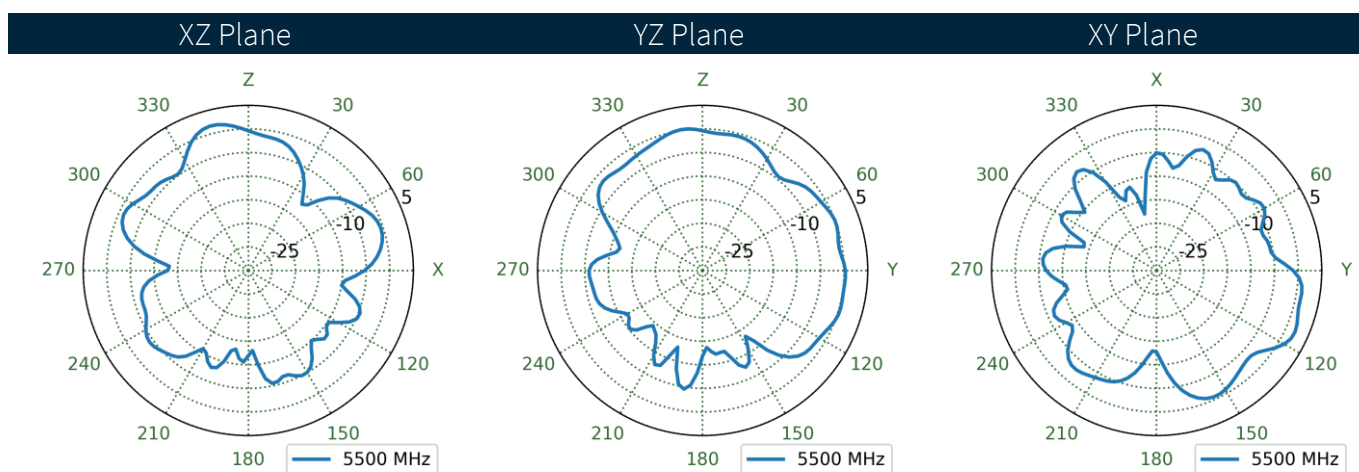
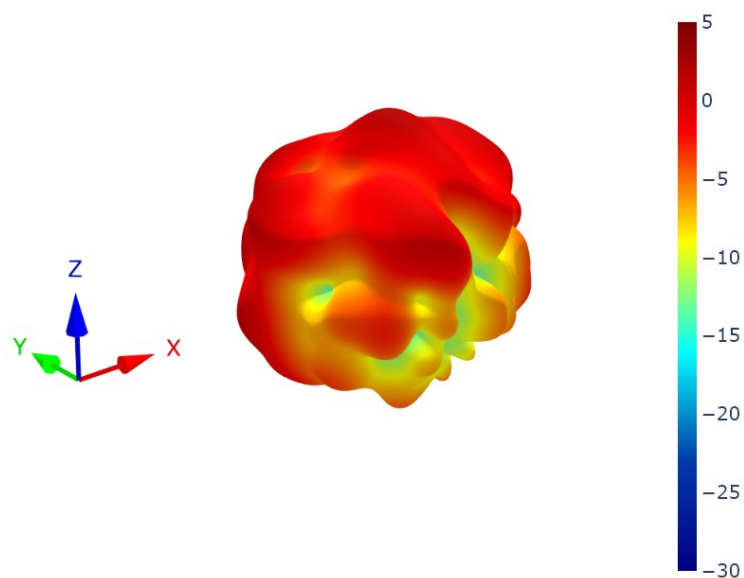
YZ Plane



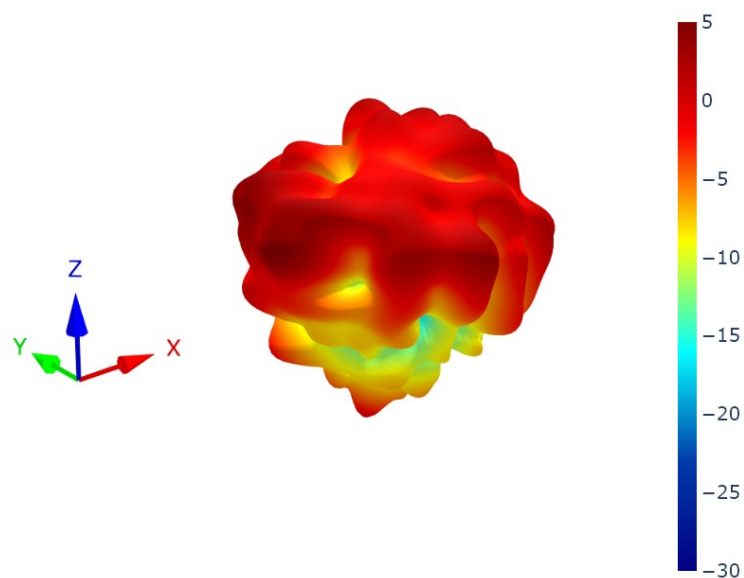
XY Plane



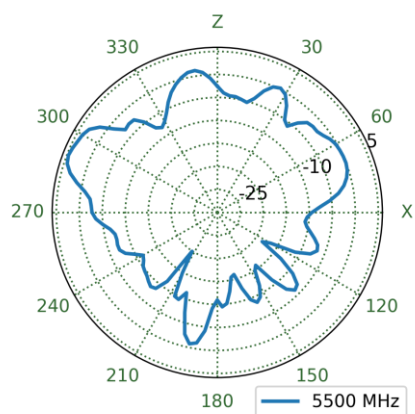
7.44 MIMO3 Wi-Fi Free Space Patterns at 5500 MHz



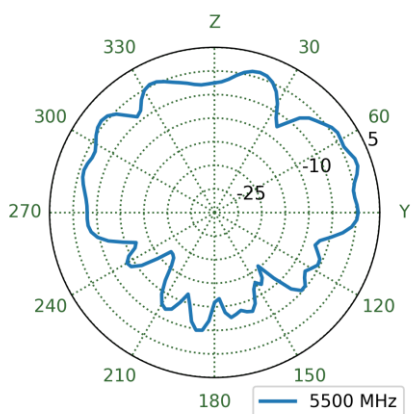
7.45 MIMO3 Wi-Fi Ground Plane Patterns at 5500 MHz



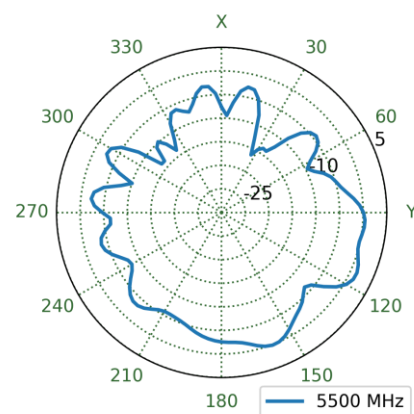
XZ Plane



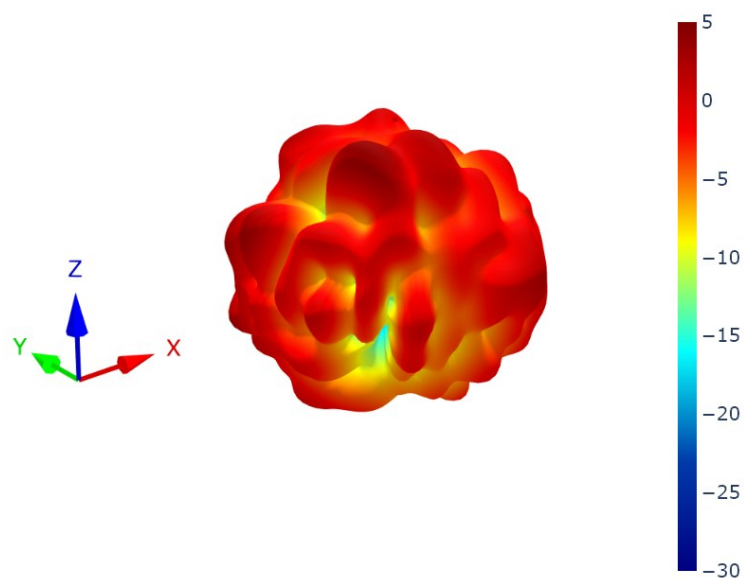
YZ Plane



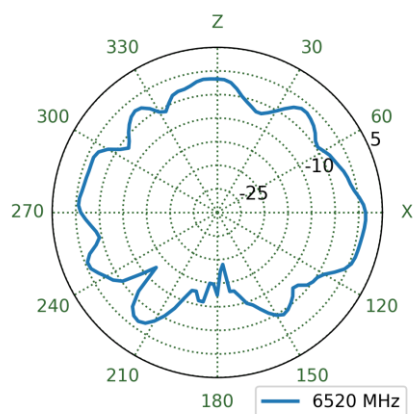
XY Plane



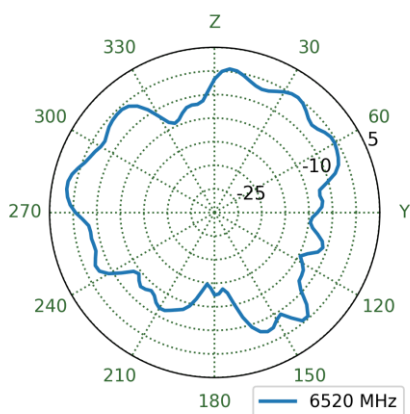
7.46 MIMO1 Wi-Fi Free Space Patterns at 6520 MHz



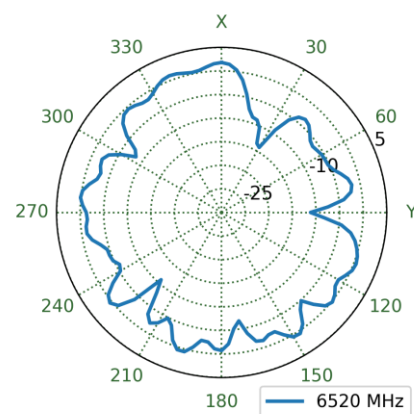
XZ Plane



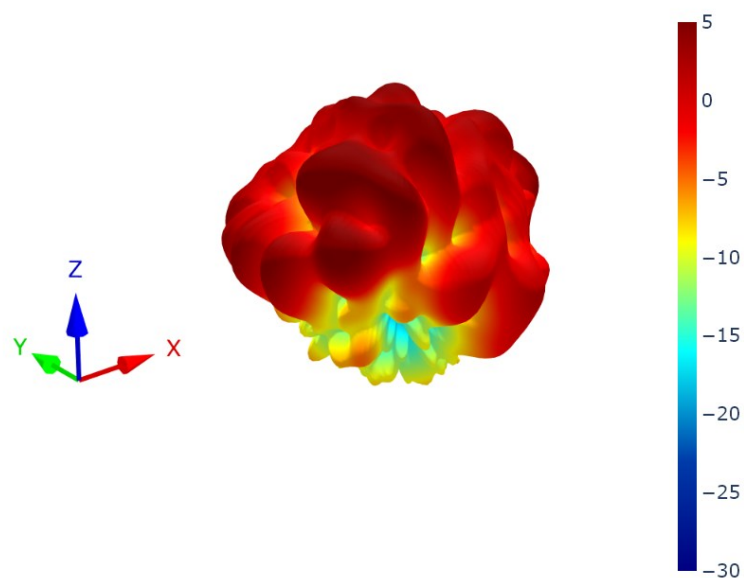
YZ Plane



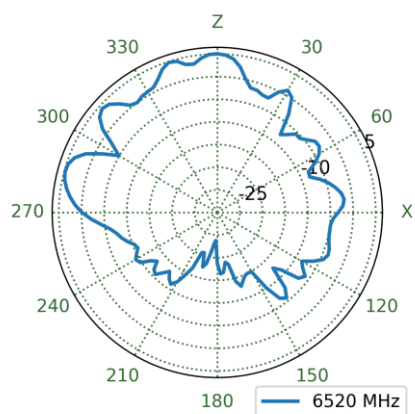
XY Plane



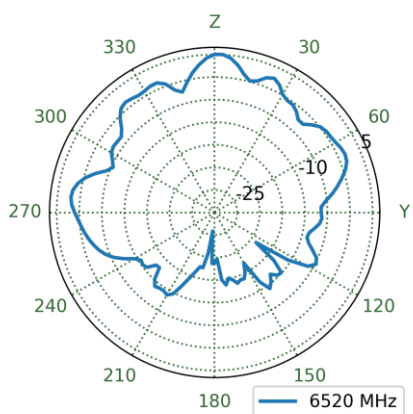
7.47 MIMO1 Wi-Fi Ground Plane Patterns at 6520 MHz



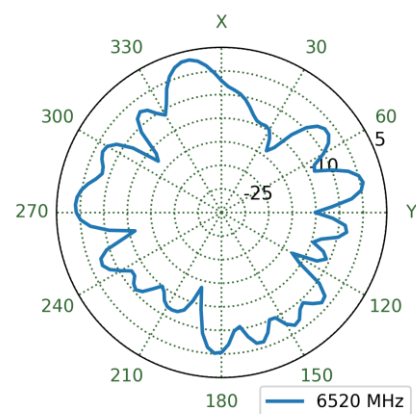
XZ Plane



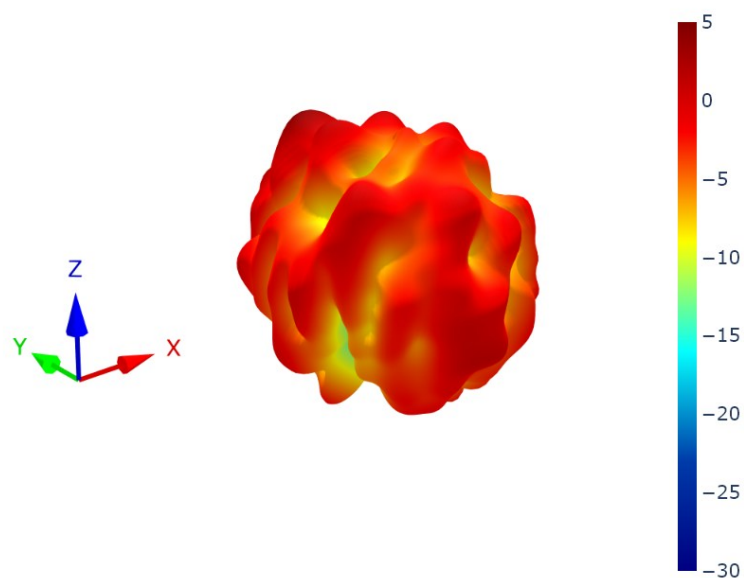
YZ Plane



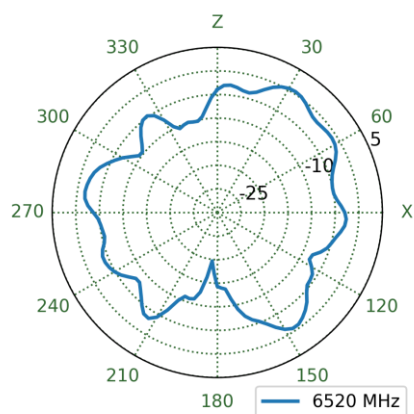
XY Plane



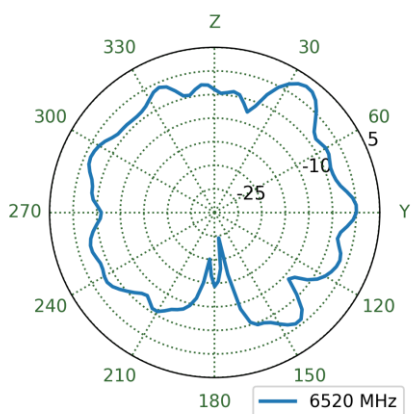
7.48 MIMO2 Wi-Fi Free Space Patterns at 6520 MHz



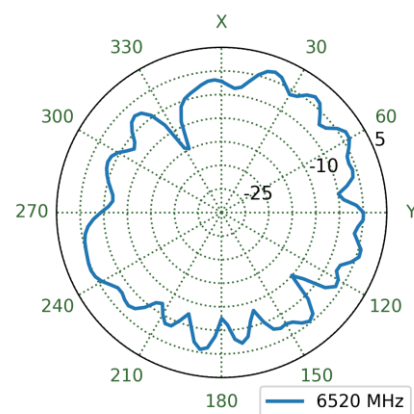
XZ Plane



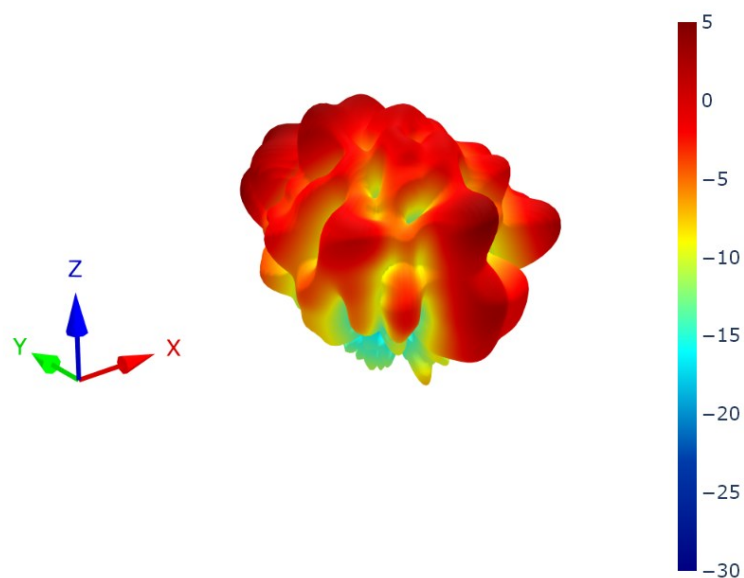
YZ Plane



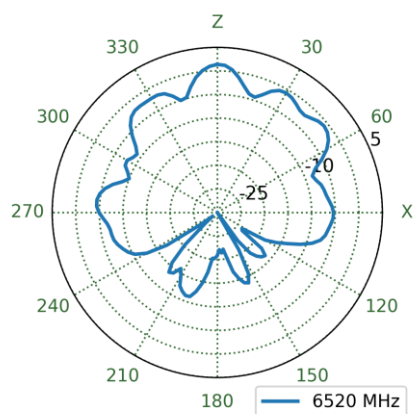
XY Plane



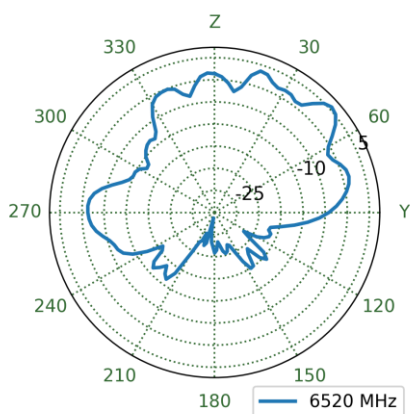
7.49 MIMO2 Wi-Fi Ground Plane Patterns at 6520 MHz



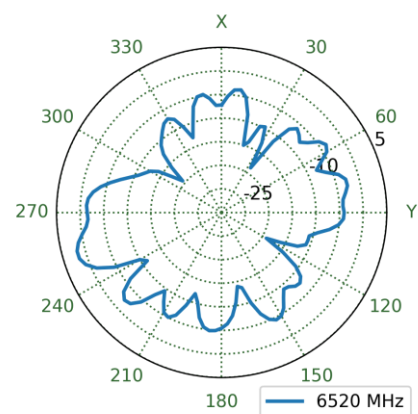
XZ Plane



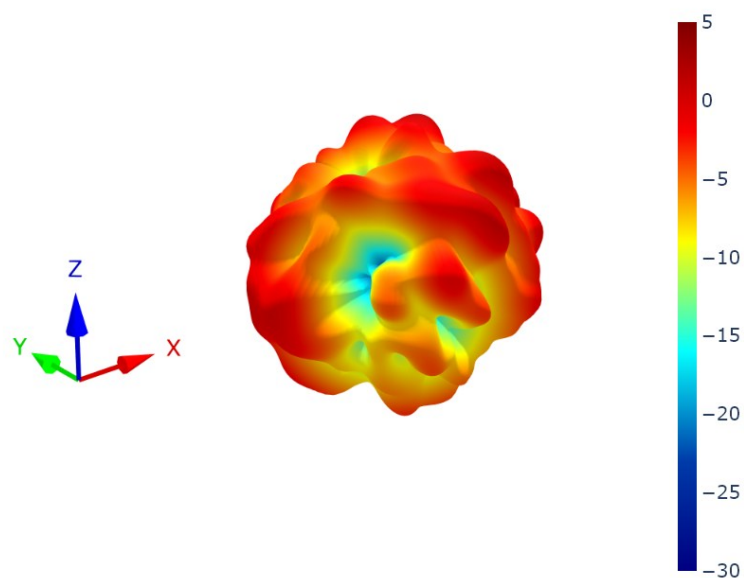
YZ Plane



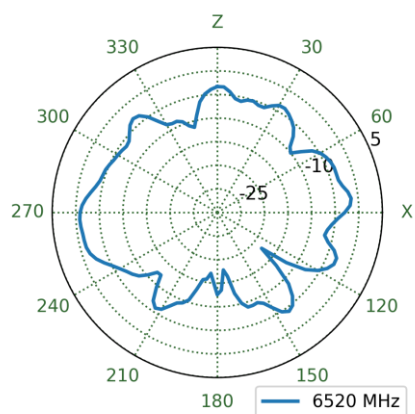
XY Plane



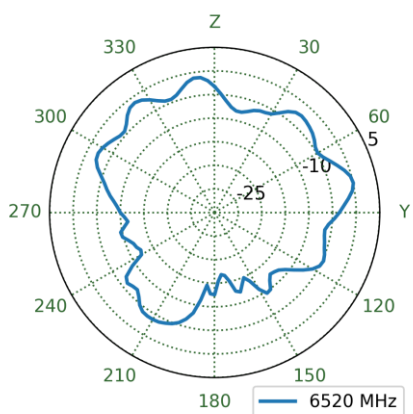
7.50 MIMO3 Wi-Fi Free Space Patterns at 6520 MHz



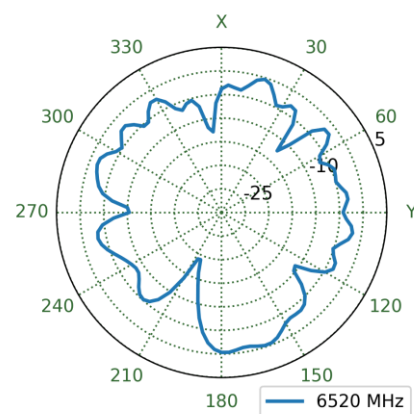
XZ Plane



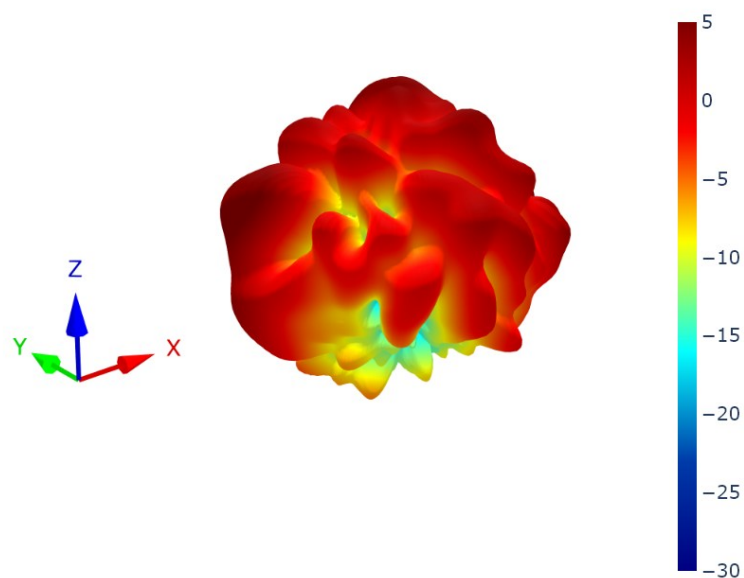
YZ Plane



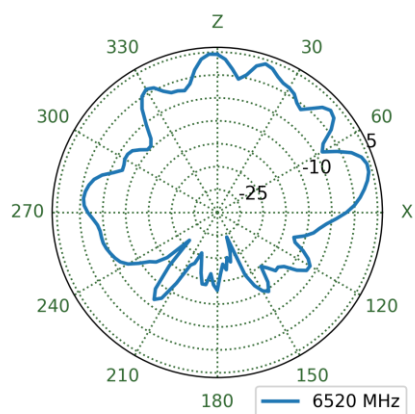
XY Plane



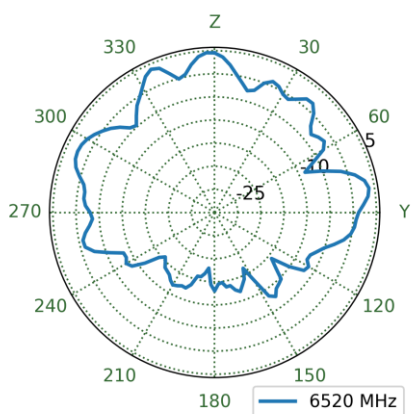
7.51 MIMO3 Wi-Fi Ground Plane Patterns at 6520 MHz



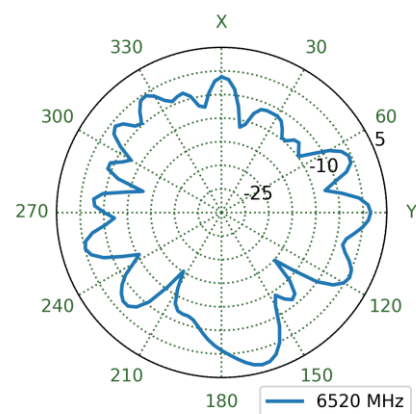
XZ Plane



YZ Plane



XY Plane



Changelog for the datasheet

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Notes:	First initial Release
Author:	Gary West

Previous Revisions



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