TAOGLAS®



Datasheet

Raptor X Rail Certified Antenna

Part No:
MA8020.10.1G4C5W.0.25M.N9.B

Description

Raptor X Rail Certified Antenna with 1x GNSS (L1/L5), 4x 5G/4G and 5x Wi-Fi® with Staggered Pigtail RG-316D Cable and N-Type(F) Connectors

Features:

1x GNSS L1/L5 Bands
4x 5G/4G LTE Cellular 600-6000 MHz
5x Wi-Fi® 2.4/5.8 GHz
Dimensions: 350 x 70 x 39 mm
M22 Mounting Thread or Aluminium Mounting Plate
EN5015 and EN45545 Certifications
IP67/IP69K Rated Enclosure
IK10 Rated Enclosure
Cable: RG316D Staggered Pigtail
Connector: N-Type(F)
RoHS & Reach Compliant

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1. Introduction



The **Raptor X Taoglas MA8020** represents a new generation of railway-certified multi-function antennas, built on the proven Raptor X platform. Re-engineered specifically for rail applications, it delivers reliable, high-speed connectivity for train-to-ground communication, passenger services, and real-time operational systems.

Taoglas **Raptor X** is a 10-in-1 combination antenna that has been engineered with dual-band GNSS L1/L5 for precision navigational accuracy, high efficiency 5G/4G wideband cellular from 600-6000 MHz for enhanced connectivity, and Dual-Band Wi-Fi® for future-proof applications at 2.4/5.8 GHz.

Designed specifically with railway installations in mind, the Raptor X MA8020 incorporates **rail-compliant cables and has been certified to EN 50155 and EN 45545 standards**. Its rugged enclosure provides **IP67 and IP69K ingress protection and it is built with IK10 impact resistance**, while a specially designed reinforced mounting base provides additional mechanical robustness for installation on trains and other transportation platforms exposed to demanding operating environments.

Measuring just **350 × 70 × 39 mm**, the MA8020 provides up to 10 antenna connections within a super compact, low-profile form factor. At only 39 mm in height, it is particularly suited to rooftop installations where installation height and available space are limited.

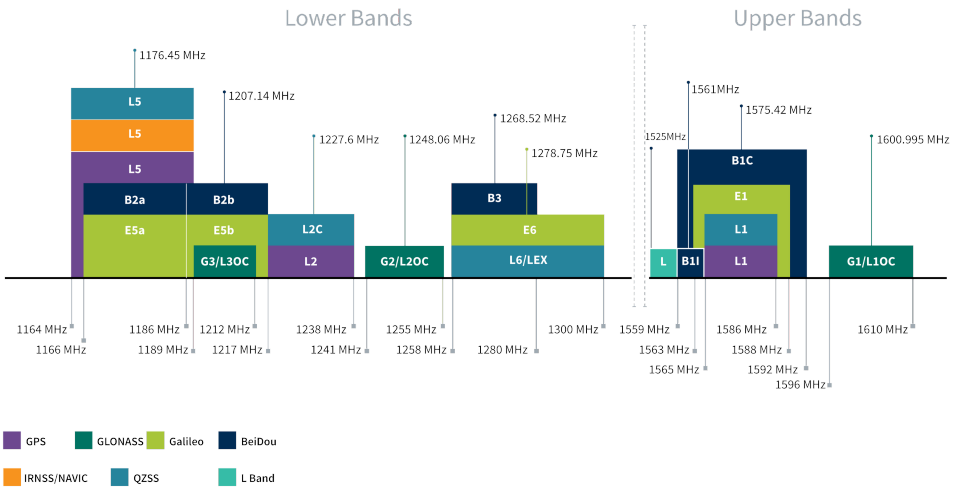
Typical applications include:

- Railway Rolling Stock
- Rail Communication and Connectivity Systems
- Public Transportation
- Emergency and First Responder Vehicles
- Commercial and Specialty Vehicles

The MA8020 has 10 connections can be customized to any requirements below 10-in-1 for specific router and customer configurations to include GNSS up to 4x cellular connections and 5x Wi-Fi® connections. The cables and connectors are fully customizable, for further information, please contact your regional Taoglas customer support team.

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
	■	■	■	□	□
L-Band	L-Band 1542 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
	■	■	■	□	□



Bands and Constellations Table

GNSS Electrical				
Frequency (MHz)	GPS_L5	BeiDou_B1	GPS_L1	GLONASS_G1
	1164-1189	1559-1592	1565-1586	1596-1610
Average Gain (dB)	-2.95	-2.00	-1.77	-2.62
Efficiency (%)	50.7	63.0	66.5	54.7
Peak Gain (dBi)	2.49	3.93	3.93	3.38
Axial Ratio at Zenith	5	4.8	11.7	13.1
Impedance	50 Ω			
Polarization	RHCP			

LNA and Filter Electrical Properties (3.3V Typ.)			
Frequency (MHz)		High-Band	Low-Band
LNA Gain (dB)		32.3	26.3
Noise Figure (dB)		2.4	3.8
Current Consumption (mA)		< 16.8	
Outer Band Attenuation (dB)	At 500 ~ 1000 MHz	> 60 dB	
	At 2000 ~ 2690MHz	> 60 dB	
	At 3300 ~ 6000MHz	> 60 dB	
Output Impedance		50 ohm	
Input Voltage(V)		+1.8 to 5.5	

Cellular Electrical								
Band	Frequency (MHz)	Set-up	Efficiency (%)	Average Gain (dB)	Peak Gain (dBi)	Impedance	Polarization	Radiation Pattern
5G NR Band 71	617-698	4G5G-1	49.8	-3.03	0.87	50 Ω	Linear	Omni
		4G5G-2	36.6	-4.37	0.91			
		4G5G-3	36.4	-4.38	1.03			
		4G5G-4	44.5	-3.52	2.25			
LTE700	698-824	4G5G-1	49.7	-3.04	2.94			
		4G5G-2	39.5	-4.03	2.11			
		4G5G-3	35.4	-4.51	1.97			
		4G5G-4	50.3	-2.99	2.25			
GSM800 900	824-960	4G5G-1	50.8	-2.94	2.64			
		4G5G-2	43.7	-3.60	2.18			
		4G5G-3	37.5	-4.26	2.17			
		4G5G-4	48.0	-3.19	2.25			
5G NR Band 1500	1427-1518	4G5G-1	27.9	-5.54	1.01			
		4G5G-2	27.8	-5.56	1.21			
		4G5G-3	24.5	-6.10	1.11			
		4G5G-4	26.7	-5.74	0.99			
5GNR N66	1710-2200	4G5G-1	47.7	-3.21	5.15			
		4G5G-2	53.7	-2.70	5.44			
		4G5G-3	51.2	-2.91	5.63			
		4G5G-4	42.5	-3.72	4.65			
LTE2600	2300-2690	4G5G-1	45.2	-3.45	6.16			
		4G5G-2	56.8	-2.45	6.97			
		4G5G-3	52.6	-2.79	6.72			
		4G5G-4	47.0	-3.28	6.15			
5GNR N77	3300-4200	4G5G-1	63.8	-1.95	6.23			
		4G5G-2	63.1	-2.00	6.78			
		4G5G-3	59.7	-2.24	7.74			
		4G5G-4	61.2	-2.13	5.97			
5GNR N78	3300-3800	4G5G-1	64.2	-1.92	6.23			
		4G5G-2	63.5	-1.97	6.78			
		4G5G-3	60.3	-2.20	7.74			
		4G5G-4	61.7	-2.10	5.97			
5GNR N79	4400-5000	4G5G-1	49.9	-3.02	5.49			
		4G5G-2	51.2	-2.91	6.77			
		4G5G-3	52.9	-2.76	5.80			
		4G5G-4	45.4	-3.43	5.96			
LTE5200	5150-5925	4G5G-1	48.9	-3.11	5.76			
		4G5G-2	41.2	-3.86	4.93			
		4G5G-3	43.5	-3.62	6.48			
		4G5G-4	40.1	-3.97	4.44			

*Tested with stagger cable on a 30x30cm Ground Plane.

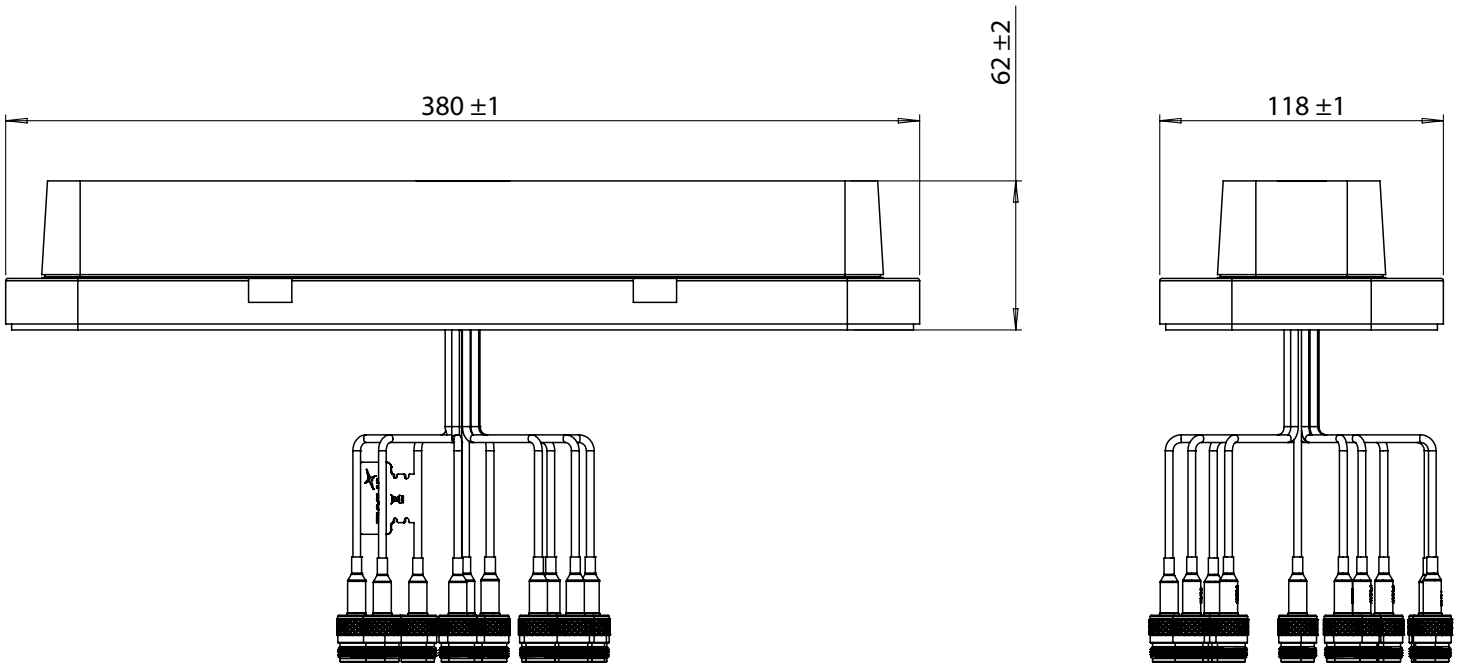
Wi-Fi Electrical		
Frequency (MHz)	Frequency (MHz)	
	2400-2500	4900-5850
Efficiency (%)		
Wi-Fi-1	40.2	48.8
Wi-Fi-2	53.7	45.8
Wi-Fi-3	50.0	46.4
Wi-Fi-4	38.8	39.4
Wi-Fi-5	31.2	40.9
Average Gain (dB)		
Wi-Fi-1	-3.96	-3.12
Wi-Fi-2	-2.70	-3.40
Wi-Fi-3	-3.01	-3.34
Wi-Fi-4	-4.12	-4.05
Wi-Fi-5	-5.05	-3.89
Peak Gain (dBi)		
Wi-Fi-1	3.56	6.56
Wi-Fi-2	6.71	6.82
Wi-Fi-3	6.09	5.42
Wi-Fi-4	2.54	5.61
Wi-Fi-5	2.37	4.48
Impedance	50 Ω	
Polarization	Linear	
Radiation Pattern	Omni	
*Tested with stagger cable on a 30x30cm Ground Plane		

Mechanical	
Dimensions	350.0 mm x 70.0 mm x 39.0 mm
Weight	945g
Material	PC
Connector	N-Type(F)
Cable	RG316D Staggered Pigtails
Enclosure Impact Rating	IK10

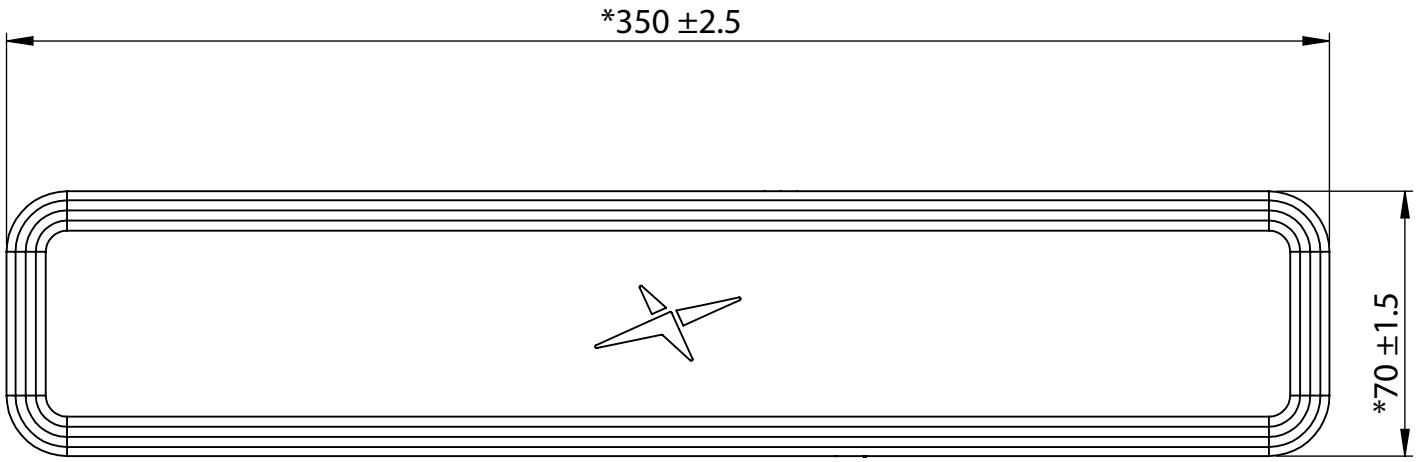
Environmental	
Waterproof Rating	IP67 / IP69K
Storage Temperature	-40°C to + 85°C
Operating Temperature	-40°C to + 85°C
Humidity	Non-condensing 65°C 95% RH

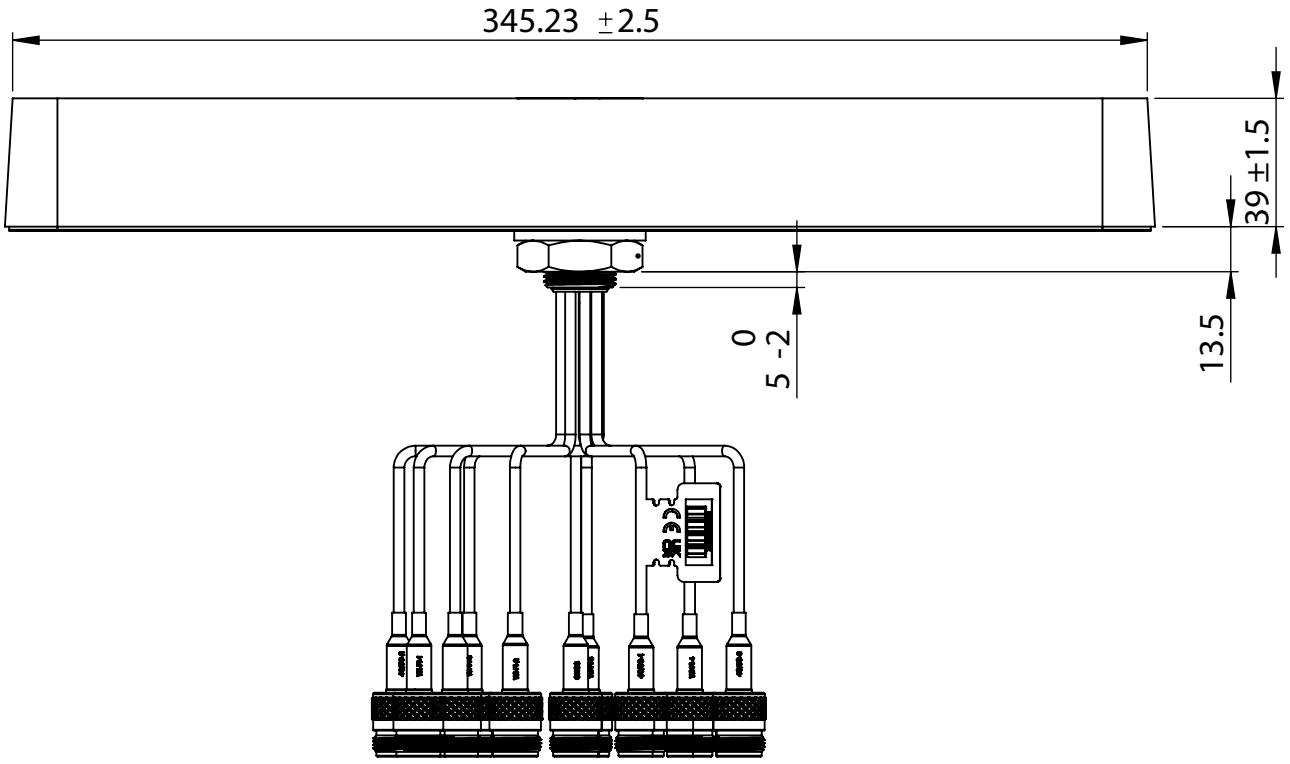
3. Mechanical Drawing

3.1 With Mounting Plate



3.2 Without Mounting Plate





4. Installation Guide

4.1 With Mounting Plate

Installation Instructions

Raptor X MA8020 Rail Antenna Series

Mounting Instructions - With Mounting Plate

A Introduction

The Taoglas MA8020 represents a new generation of railway-certified multi-function antennas, built on the proven Raptor X platform. Re-engineered specifically for rail applications, it delivers reliable, high-speed connectivity for train-to-ground communication, passenger services, and real-time operational systems.

Optimised for demanding rail environments, the MA8020 is engineered to meet stringent EN50155 railway standards for mechanical and RF performance and adheres to EN45545 fire safety requirements, ensuring long-term reliability, safety, and compliance in rolling stock installations.



Electrical Safety

The Raptor X contains an active GPS/GNSS antenna. Rated voltage: 3-5V DC Rated current: 20mA maximum

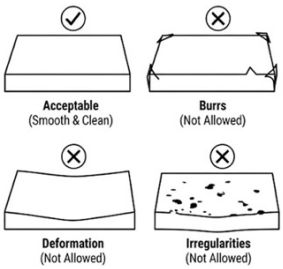
The supply to this device must be provided with overcurrent protection of 1A maximum.

Power consumption @3.3V - 16.8 mA | Input Voltage (V) - +1.8 to 5.5

B Mounting Surface Requirements

The mounting surface shall be flat and rigid, with a flatness tolerance not exceeding 0.5 mm. The surface finish shall comply with roughness grade N8 in accordance with ISO surface texture standards.

The mounting base material shall have a minimum thickness of 6 mm. The surface shall be free from burrs, deformation, and irregularities that could affect proper installation or load distribution.



C Surface Preparation

The mounting area shall be cleaned to bare metal prior to installation. All coatings and contaminants—including paint, corrosion products, anodized layers, dust, machining chips, burrs, oil, and grease—shall be completely removed. The surface shall be dry, smooth, and free of residues that could impair mechanical contact bonding.

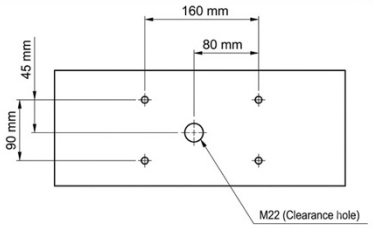


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D Mounting

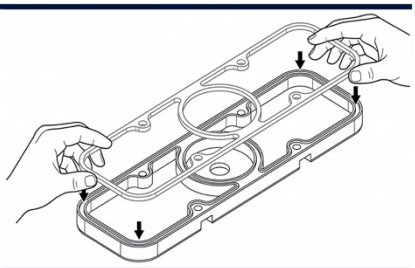
Drill a central hole of M22 Clearance Hole at the specified location on the mounting plate. Ensure the hole is perpendicular to the surface and free from burrs after drilling.

Verify all hole positions and dimensions before installation to ensure proper alignment of the assembly.



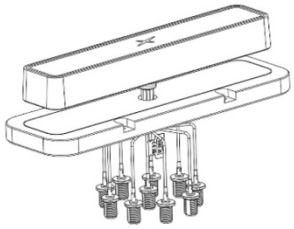
E Gasket Installation

Position the gasket over the mounting plate and align it with the designated groove features. Press the gasket uniformly into the groove along its entire perimeter until it is fully seated. Ensure correct alignment and verify that the gasket is not twisted, stretched, or protruding outside the groove.



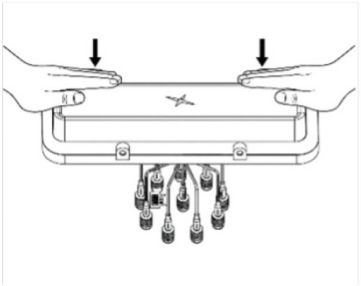
F Cable Routing and Connection

Route all cables through the central hole in the mounting plate as shown and ensure the cables pass freely without twisting, bending, or pinching. Verify that the cable bundle is centred within the hole and that adequate clearance is maintained to prevent damage during installation.



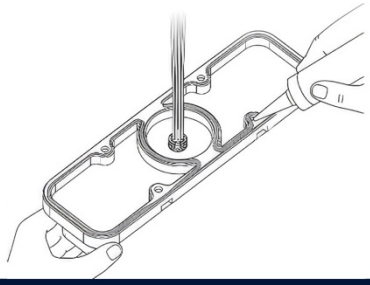
G Stick Antenna to Mounting Bracket

Position the antenna onto the mounting plate, ensuring proper alignment with the mounting features and central hole and align to the embossed profile. Peel the protective liner from the adhesive surface of the antenna base, ensuring the adhesive surface is not touched or contaminated. Apply uniform downward pressure using both hands as shown to ensure proper seating and full contact of the adhesive with the surface. Avoid shifting the antenna after placement.



H Applying PU Sealant

Apply a continuous and uniform bead of silicone/PU sealant along the designated groove area of the mounting plate as indicated. Ensure complete coverage without gaps or air pockets. The sealant bead shall be consistent in thickness to ensure proper sealing performance. Avoid excess application beyond the groove boundaries.



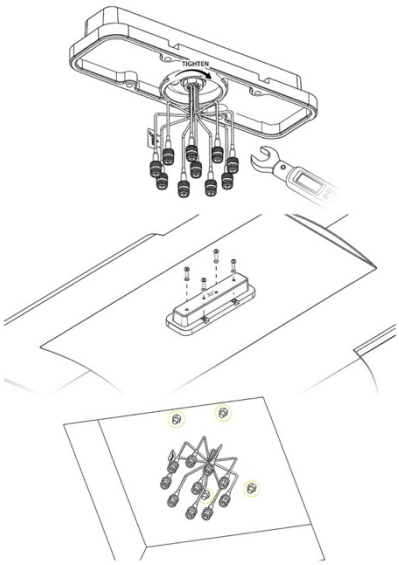
I Mounting on Carriage Surface

Position the open-head torque wrench correctly onto the hex nut, ensuring full engagement and proper alignment. Tighten the fastener clockwise until a torque of 12 Nm is achieved. Apply force steadily and avoid angular misalignment to prevent damage.

Insert mounting screws with washers through the antenna housing into the mounting plate. Ensure proper alignment, then tighten uniformly in a cross pattern.

Pass connector cables through the panel holes from the outside, aligning all threaded sections. Fully insert connectors and install mounting nuts from the inside.

Hand-tighten first to maintain alignment, then securely tighten with a suitable spanner or torque tool.



J Notices

Warning
Handle with care when installing. Dropping the antenna may compromise its performance.

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 Electrical and Electronics are recycled do not throw them away into standard waste.

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

Harmonized Standards and References:
EN 301 489-1 (V2.2.3): Electro Magnetic Compatibility (EMC) standard for radio equipment and services;
Part 1: Common technical requirements; Harmonized Standard for Electro Magnetic Compatibility

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4.2 Without Mounting Plate

Installation Instructions

Raptor X MA8020 Rail Antenna Series

Mounting Instructions - Without Mounting Plate

A Introduction

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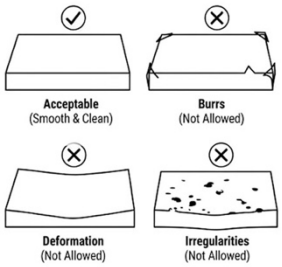
Electrical Safety
The Raptor X contains an active GPS/GNSS antenna. Rated voltage: 3-5V DC Rated current: 20mA maximum
The supply to this device must be provided with overcurrent protection of 1A maximum.

Power consumption @3.3V - 16.8 mA | Input Voltage (V) - +1.8 to 5.5

B Mounting Surface Requirements

The mounting surface shall be flat and rigid, with a flatness tolerance not exceeding 0.5 mm. The surface finish shall comply with roughness grade N8 in accordance with ISO surface texture standards.

The mounting base material shall have a minimum thickness of 6 mm. The surface shall be free from burrs, deformation, and irregularities that could affect proper installation or load distribution.

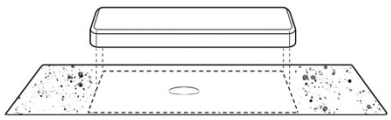


C Surface Preparation

The mounting area shall be cleaned to bare metal prior to installation. All coatings and contaminants—including paint, corrosion products, anodized layers, dust, machining chips, burrs, oil, and grease—shall be completely removed. The surface shall be dry, smooth, and free of residues that could impair mechanical contact bonding.







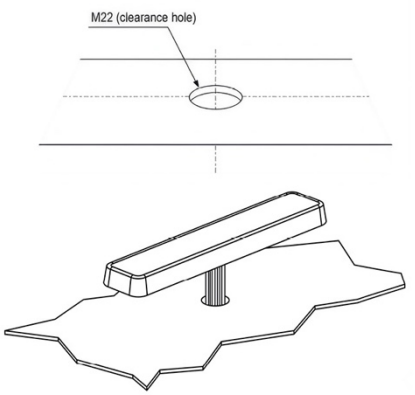
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D Mounting

Drill a M22 (Clearance) hole at the specified location on the mounting surface using a suitable hole saw. Ensure the drill is held perpendicular to the surface to maintain dimensional accuracy. After drilling, remove all burrs and clean the area to prepare for installation.

Pass all antenna cables through the drilled central hole in the mounting surface as shown.

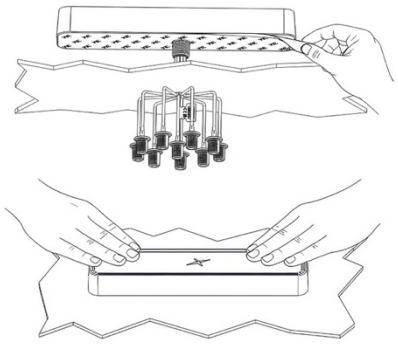
Ensure the cables are routed straight without twisting or sharp bends and verify that no pinching or damage occurs during routing



E Adhesive Mount

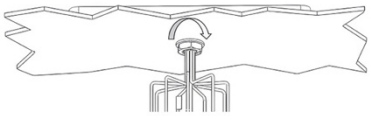
Remove the protective liner from the adhesive surface of the antenna base as shown. Peel the liner gradually from one edge, ensuring the adhesive surface is not touched or contaminated. Proceed with installation immediately after removal to maintain optimal adhesion.

Place the antenna onto the mounting surface and align it with the designated position. Apply uniform downward pressure using both hands as shown to ensure proper seating and full contact of the adhesive with the surface. Avoid shifting the antenna after placement.



F Locking Mounting Nut

Tighten the mounting nut using an open-head torque wrench as shown. Apply torque in the clockwise direction until a value of 12 Nm is reached. Ensure proper tool alignment with the nut to avoid slippage or damage during tightening.



G Notices

Warning
Handle with care when installing. Dropping the antenna may compromise its performance.

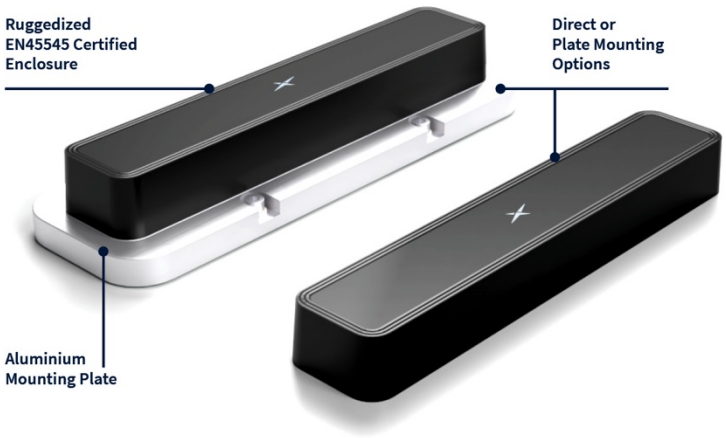
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Warning
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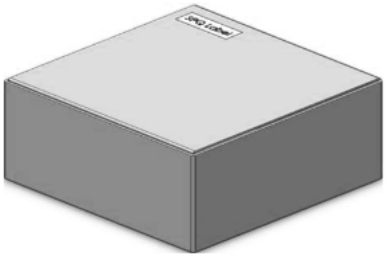
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5. Packaging

1pc MA8020 per PE Bag
PE Bag (mm): 380 x 480



1pc MA8020 per Box
Box (mm): 358 x 340 x 78
Weight (kg): 1.23
SPQ Label

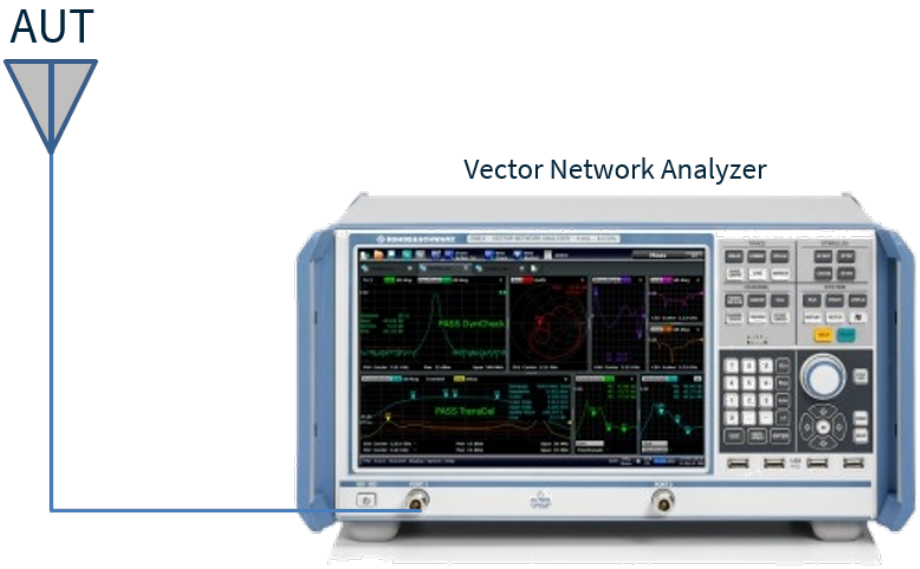


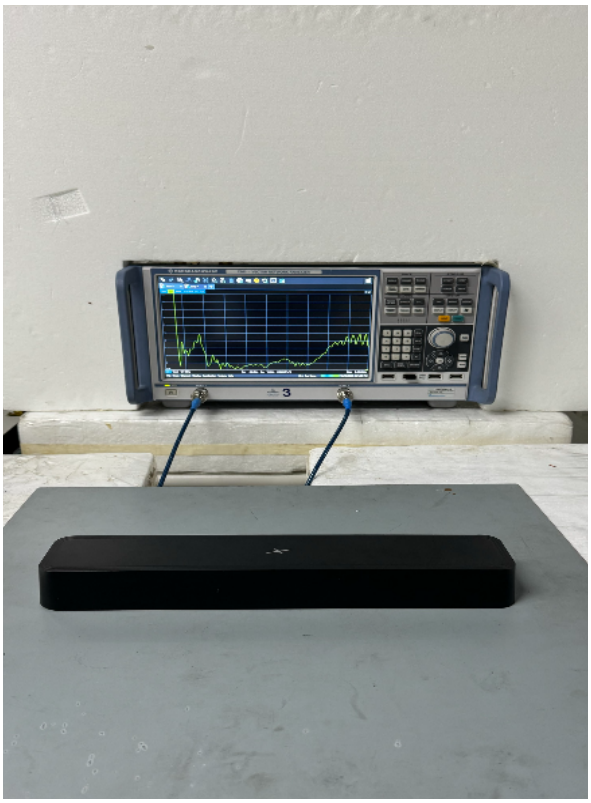
4pcs MA8020 per carton
Carton (mm): 370 x 370 x 300
Weight (kg): 5.79
Carton Label



6. Antenna Characteristics

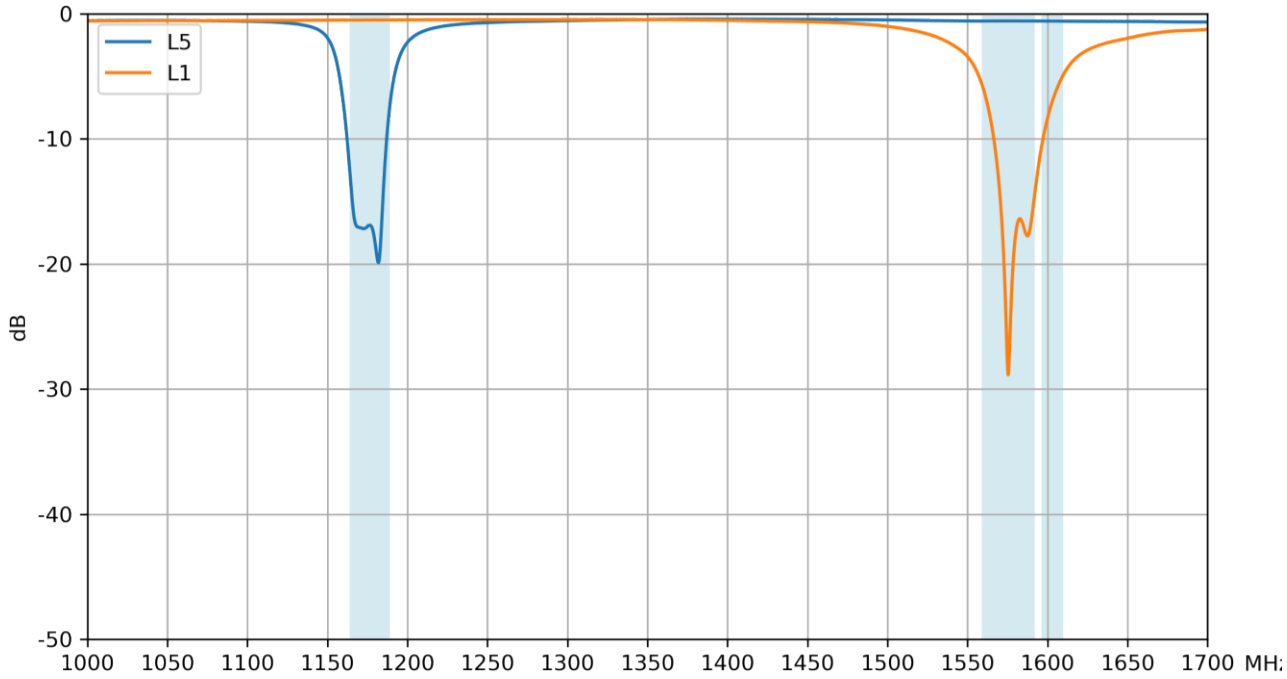
6.1 Test Set-up



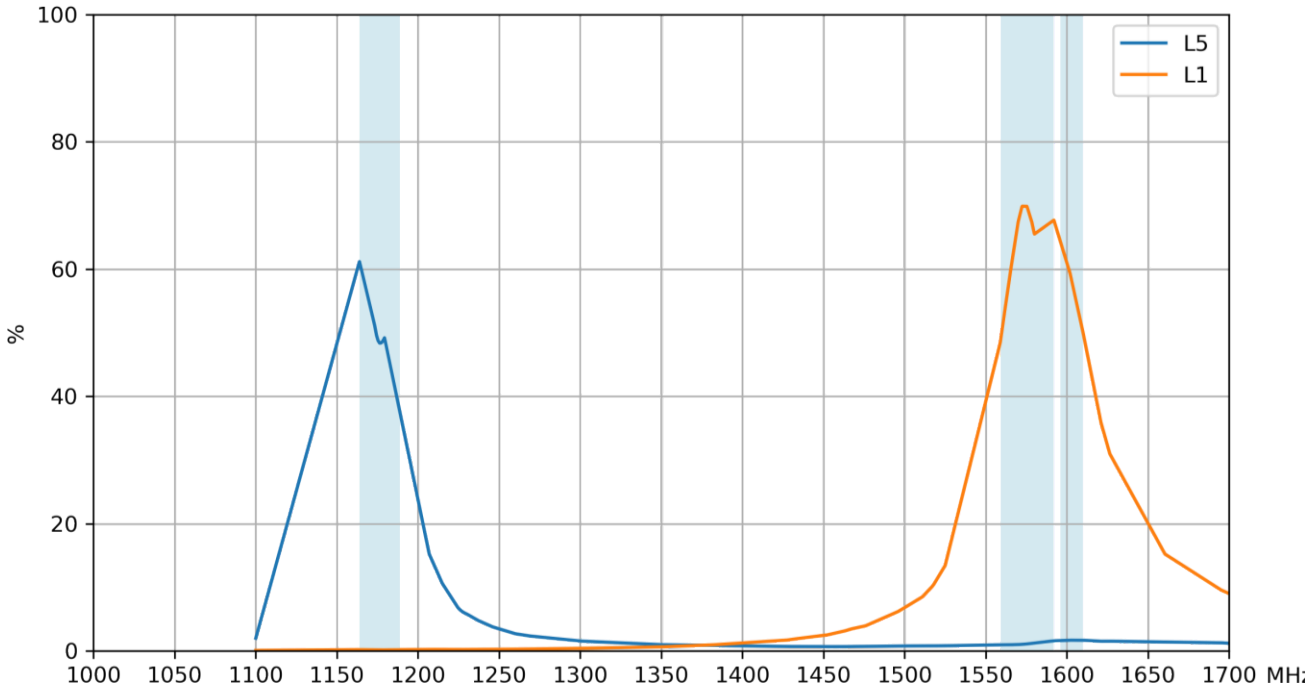


VNA Test Set up

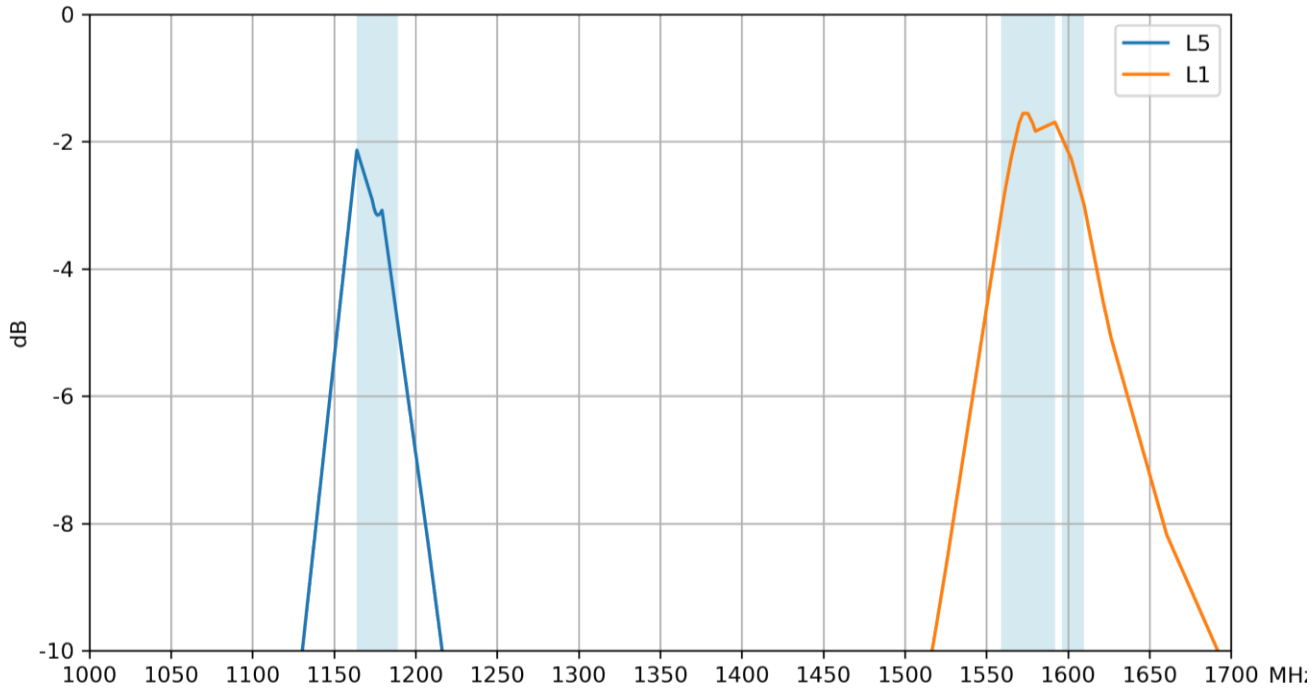
6.2 Return Loss (GNSS)



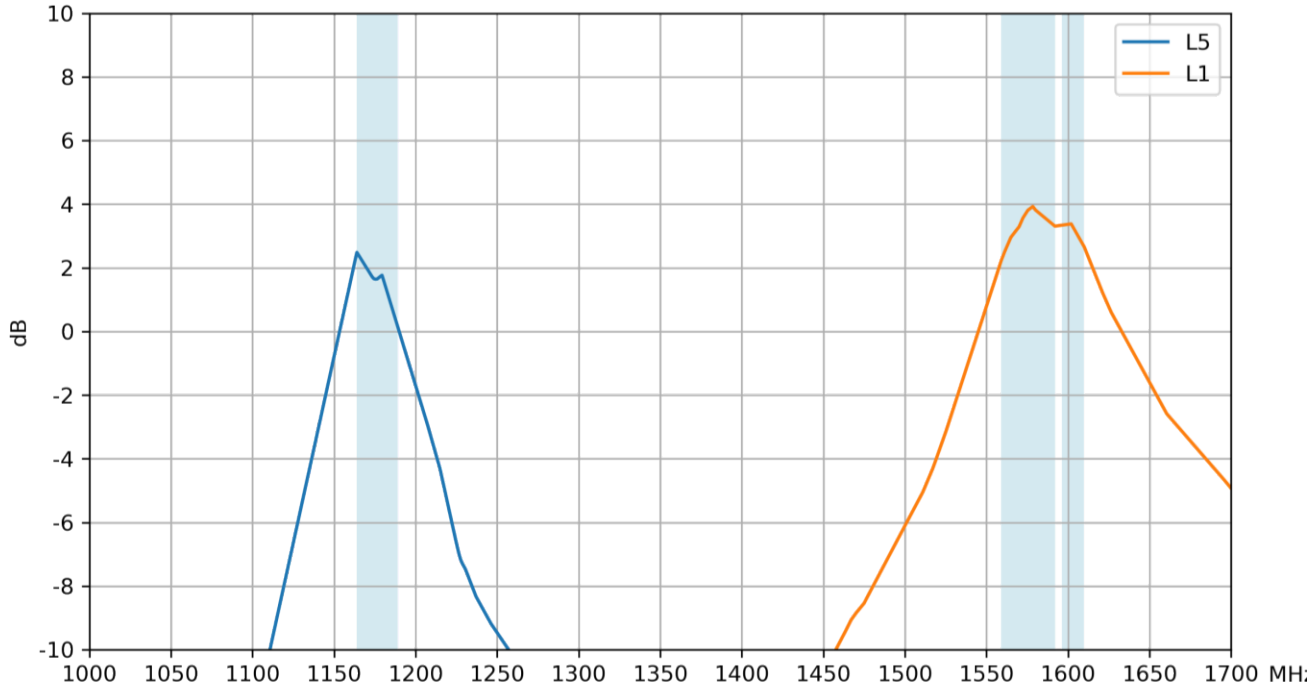
6.3 Efficiency (GNSS)



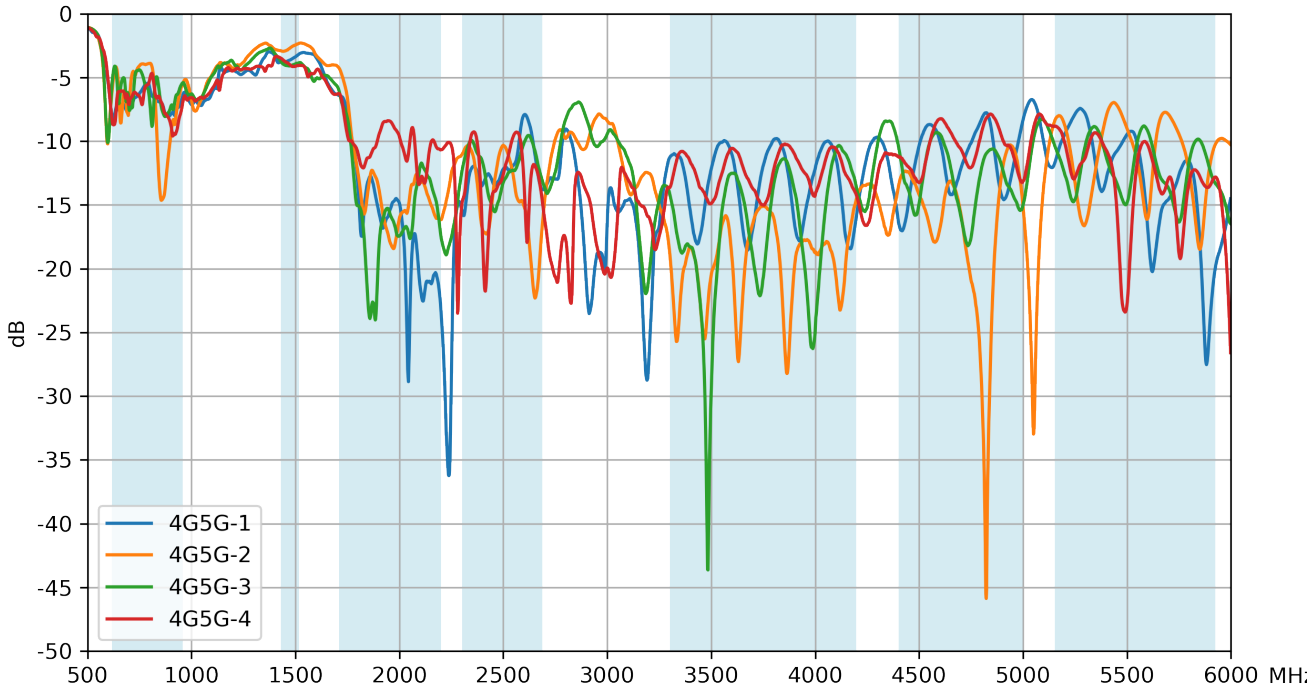
6.4 Average Gain (GNSS)



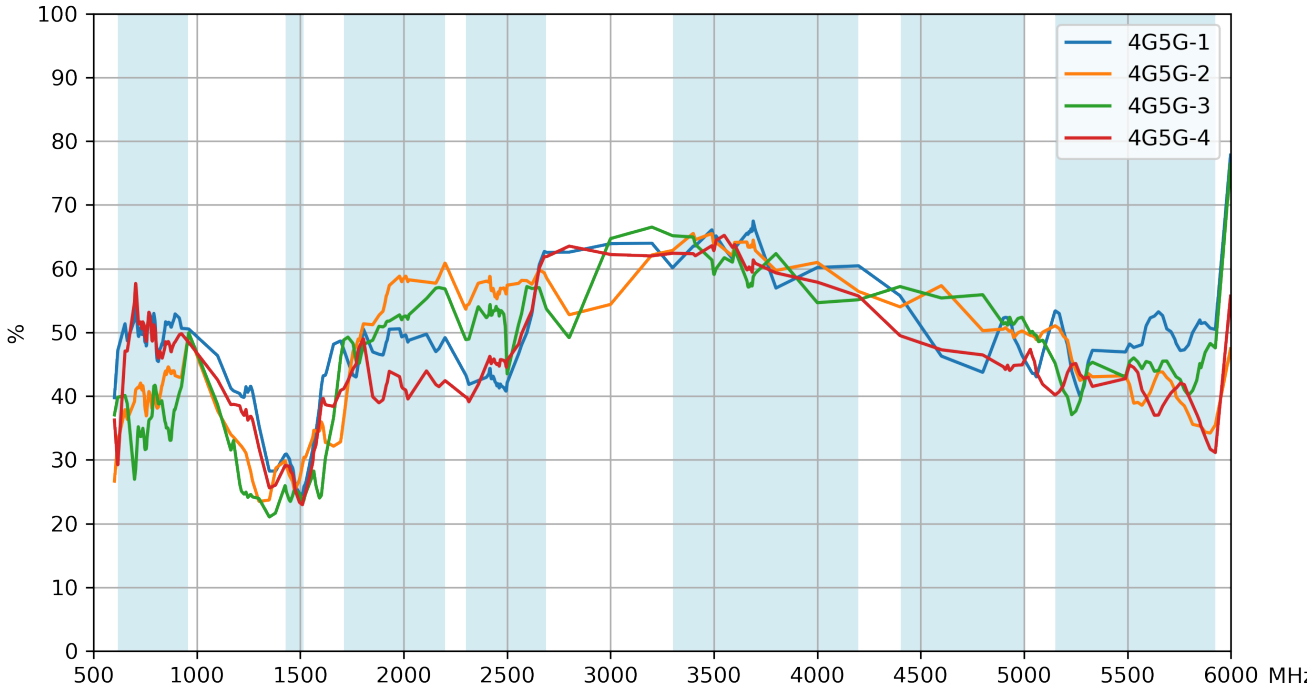
6.5 Peak Gain (GNSS)



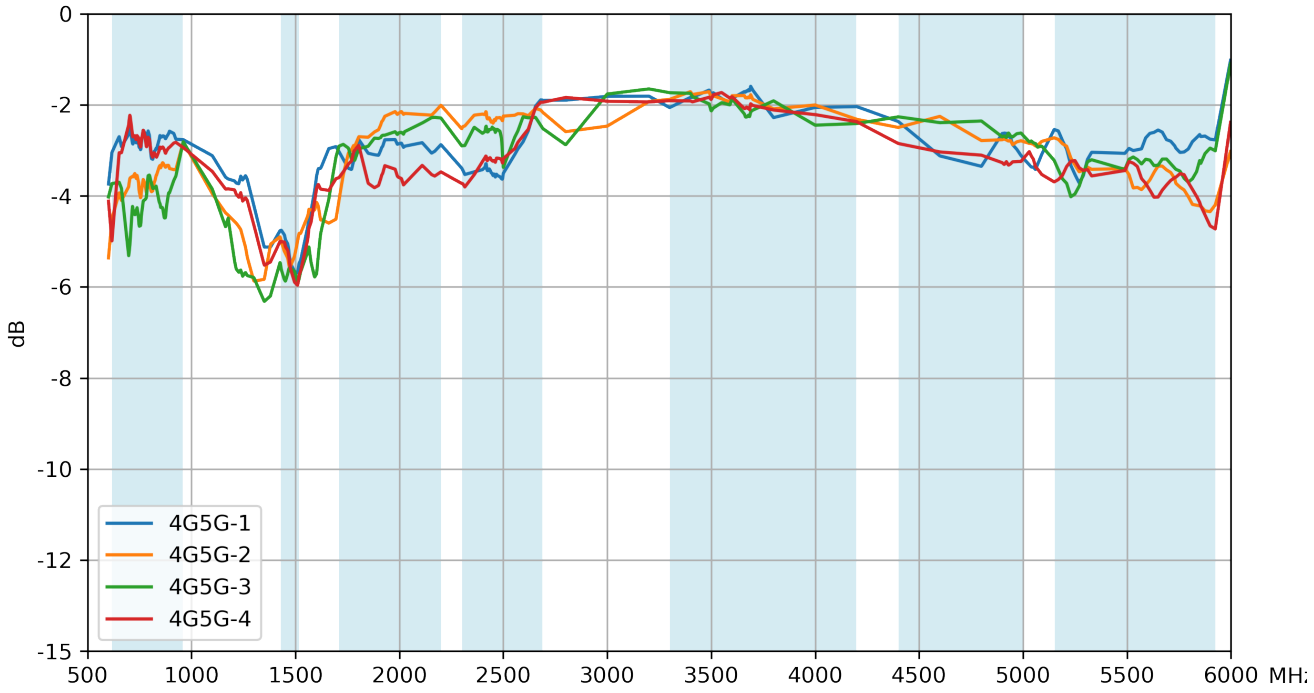
6.6 Return Loss (4G/5G)



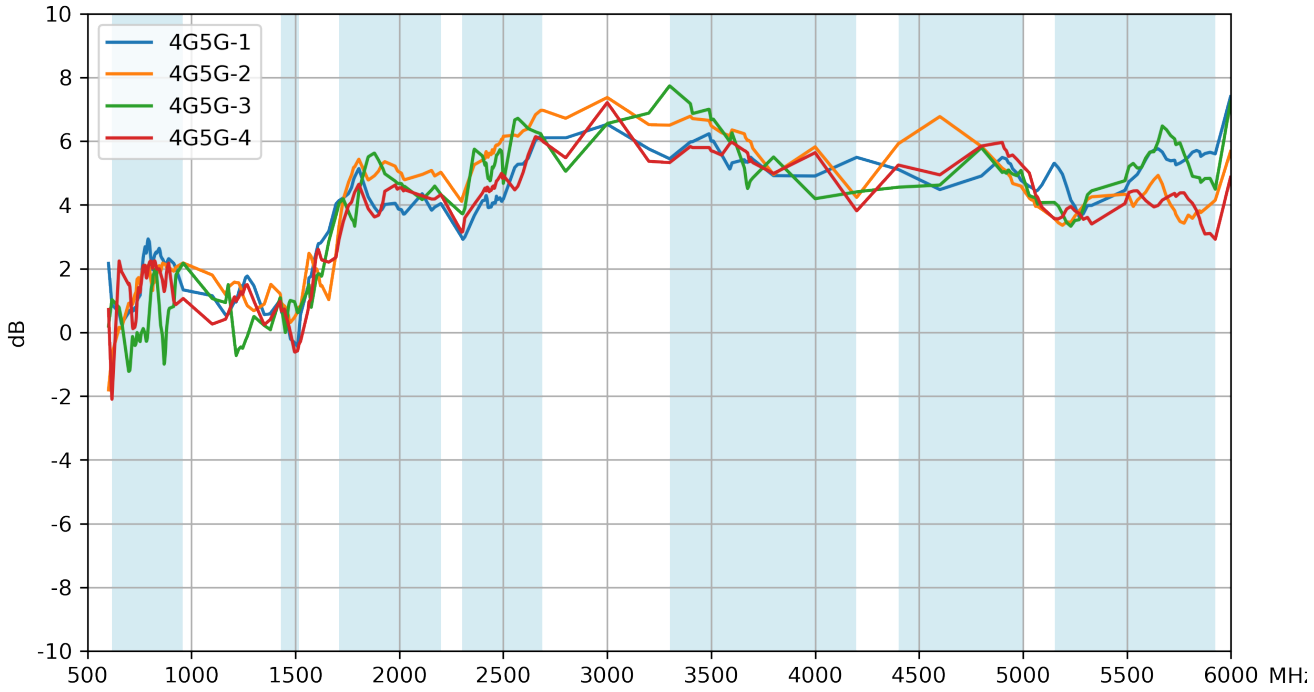
6.7 Efficiency (4G/5G)



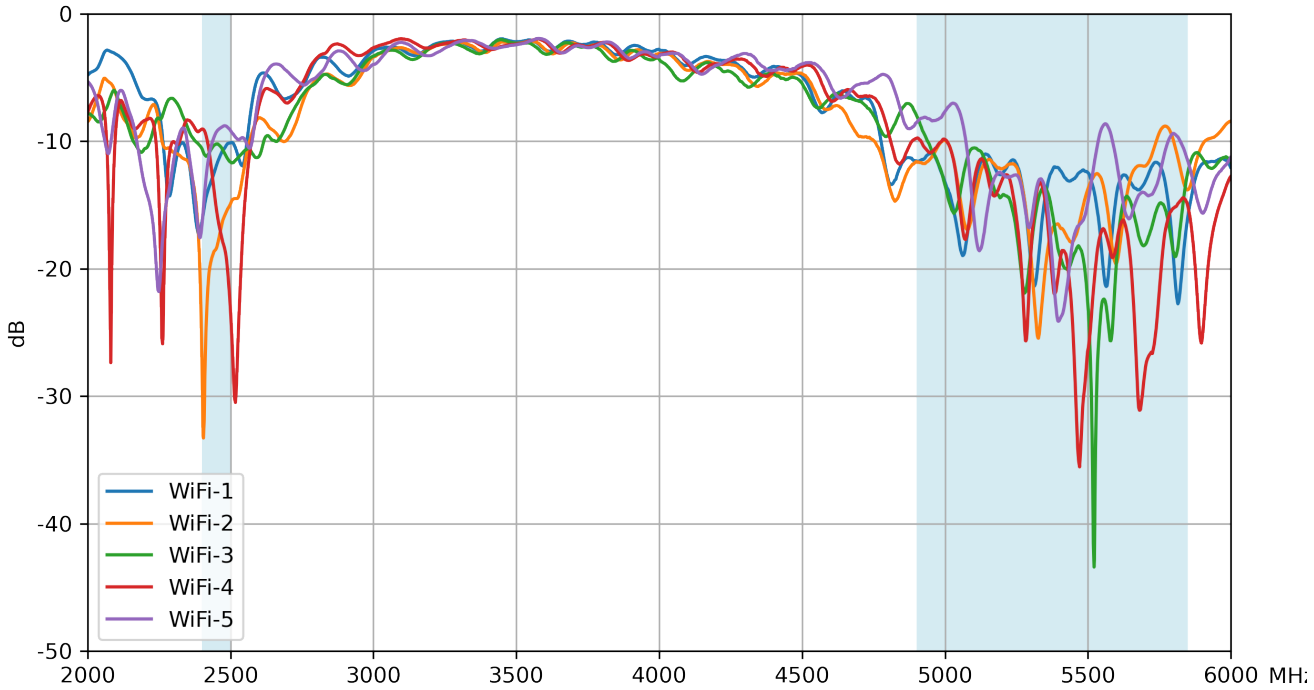
6.8 Average Gain (4G/5G)



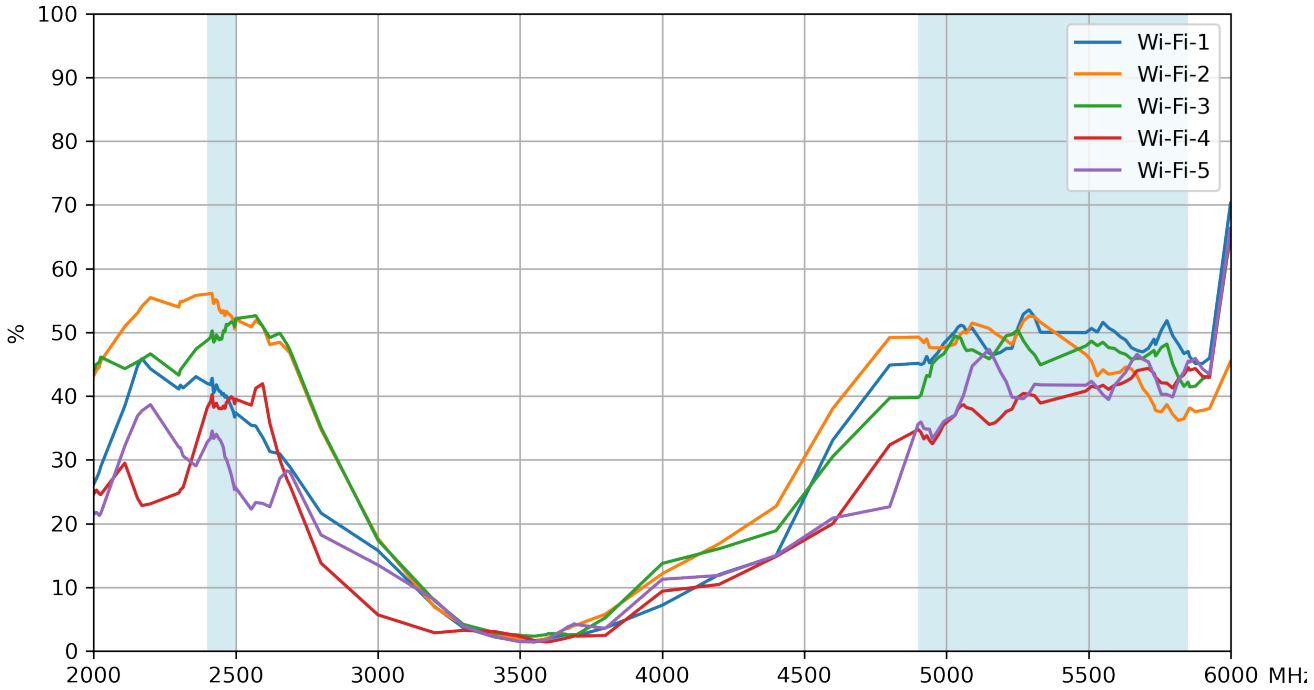
6.9 Peak Gain (4G/5G)



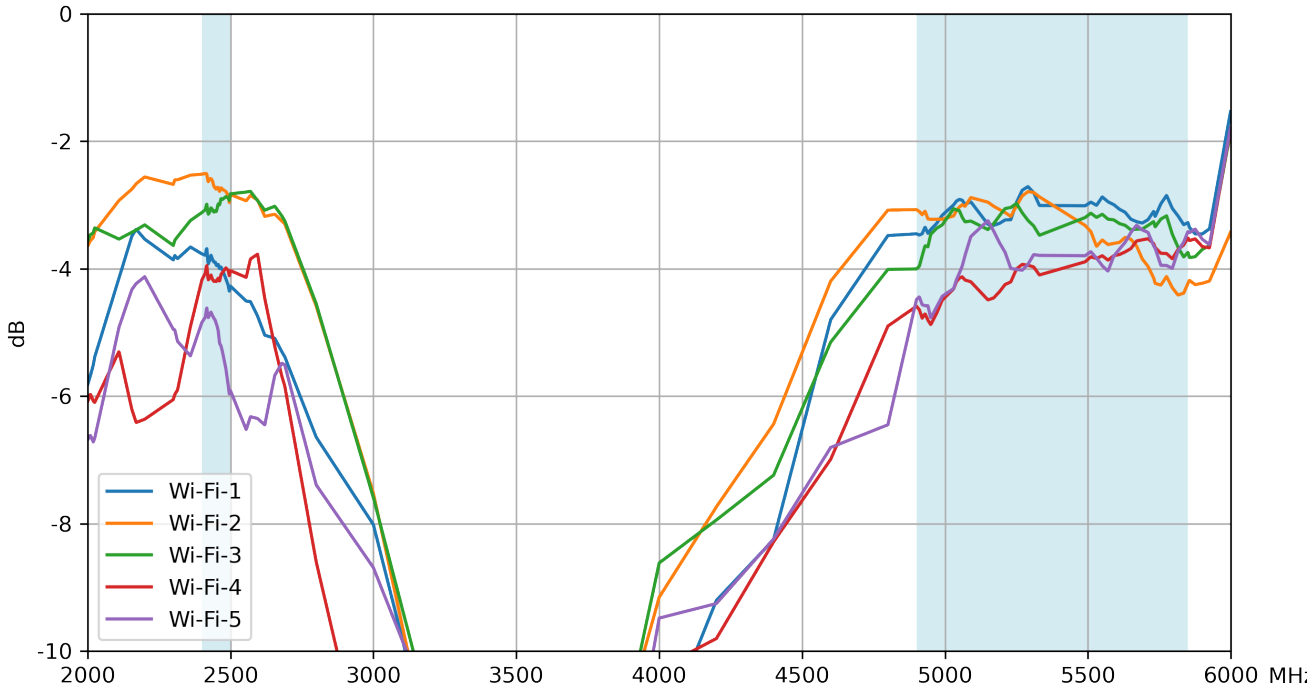
6.10 Return Loss (Wi-Fi)



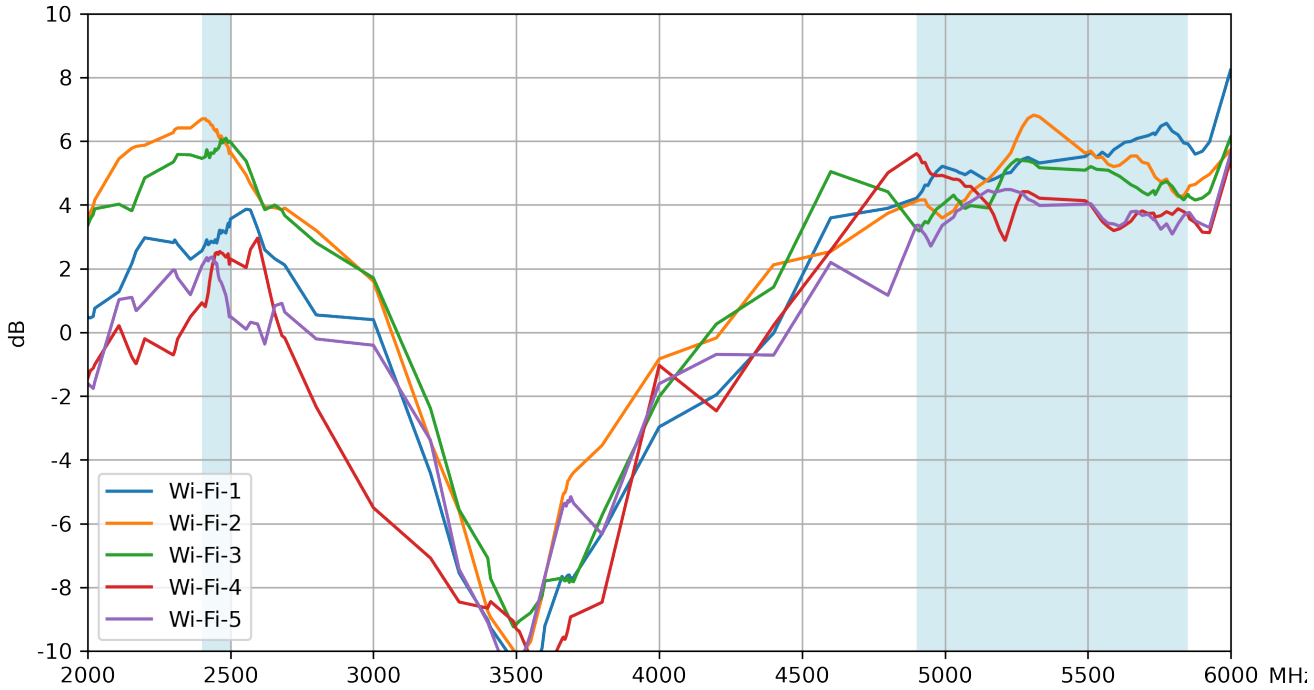
6.11 Efficiency (Wi-Fi)



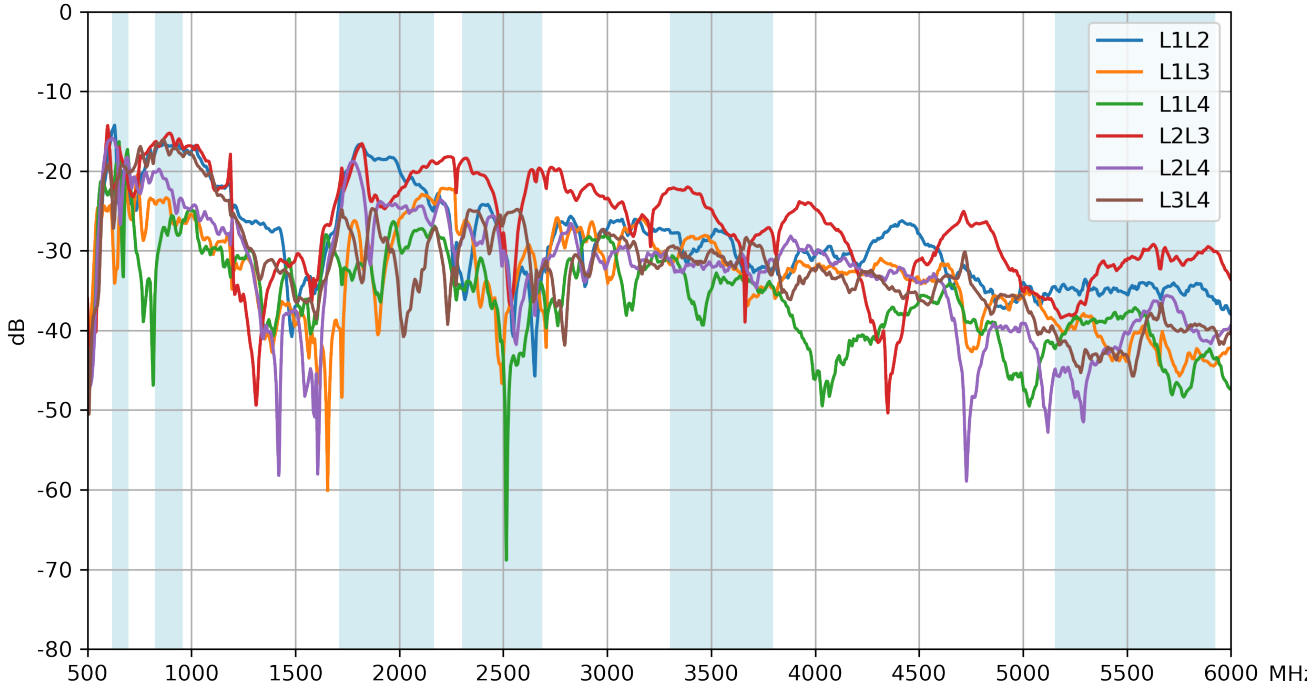
6.12 Average Gain (Wi-Fi)



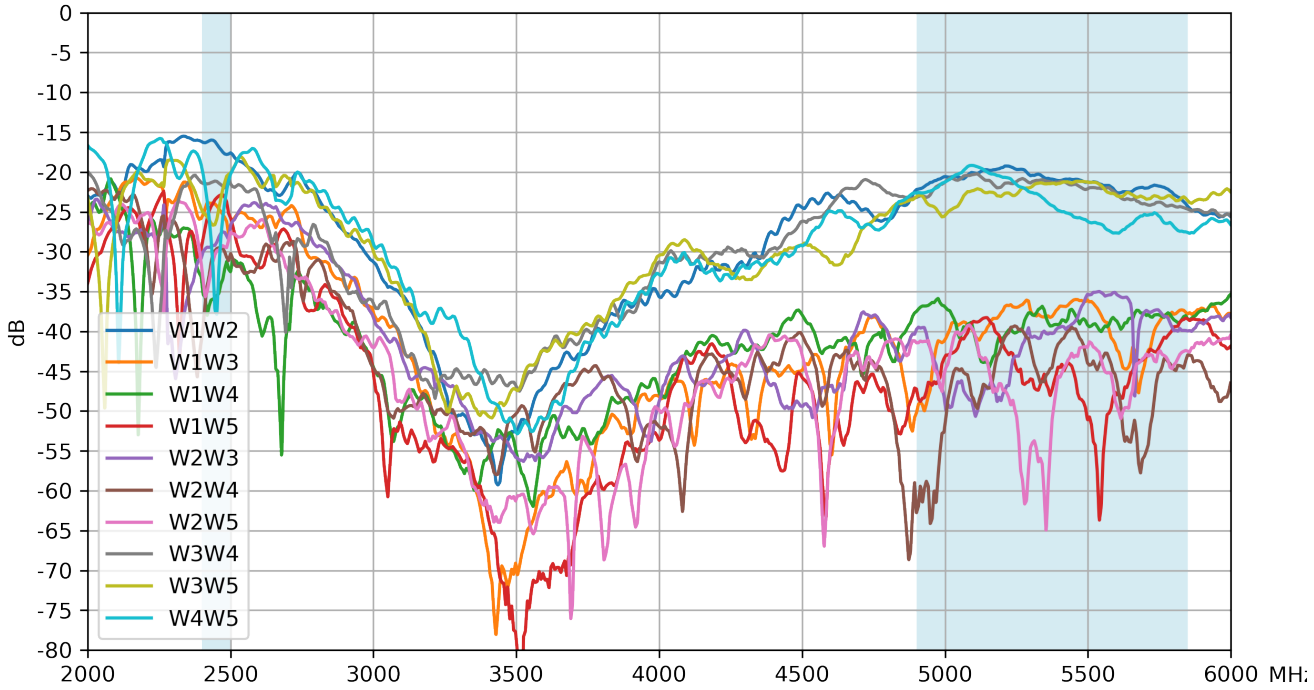
6.13 Peak Gain (Wi-Fi)



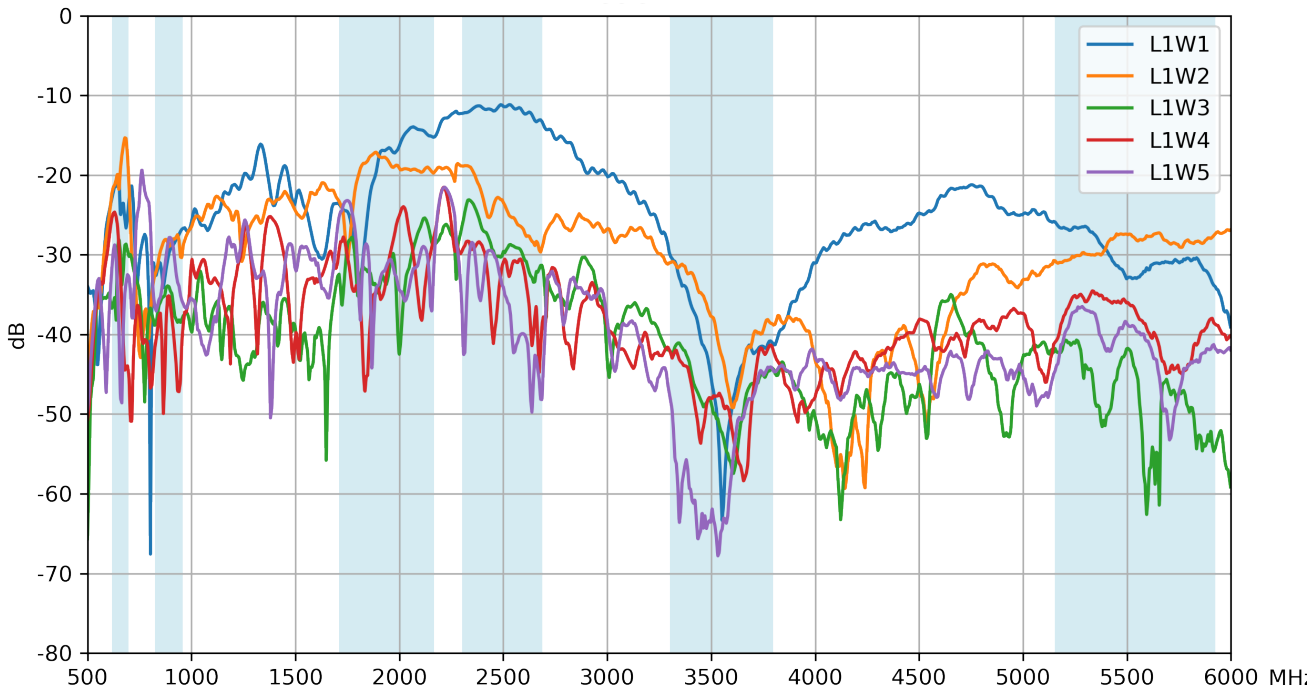
6.14 Isolation (4G/5G)



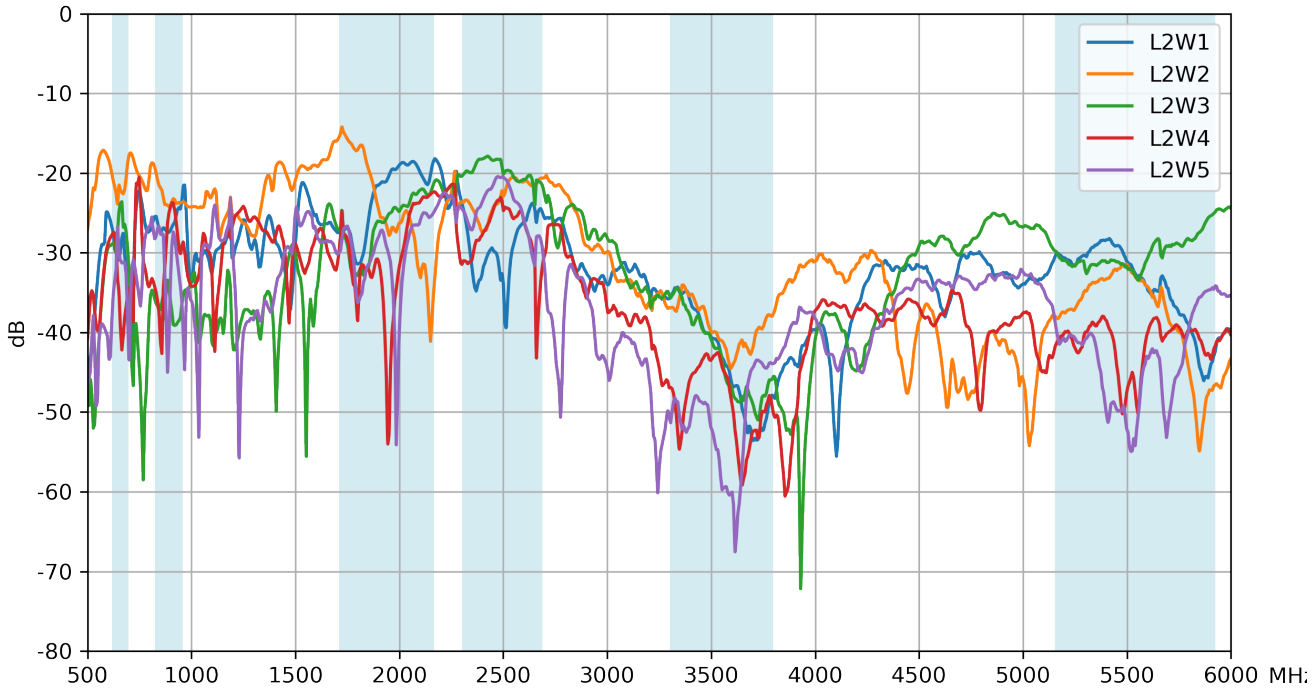
6.15 Isolation (Wi-Fi)



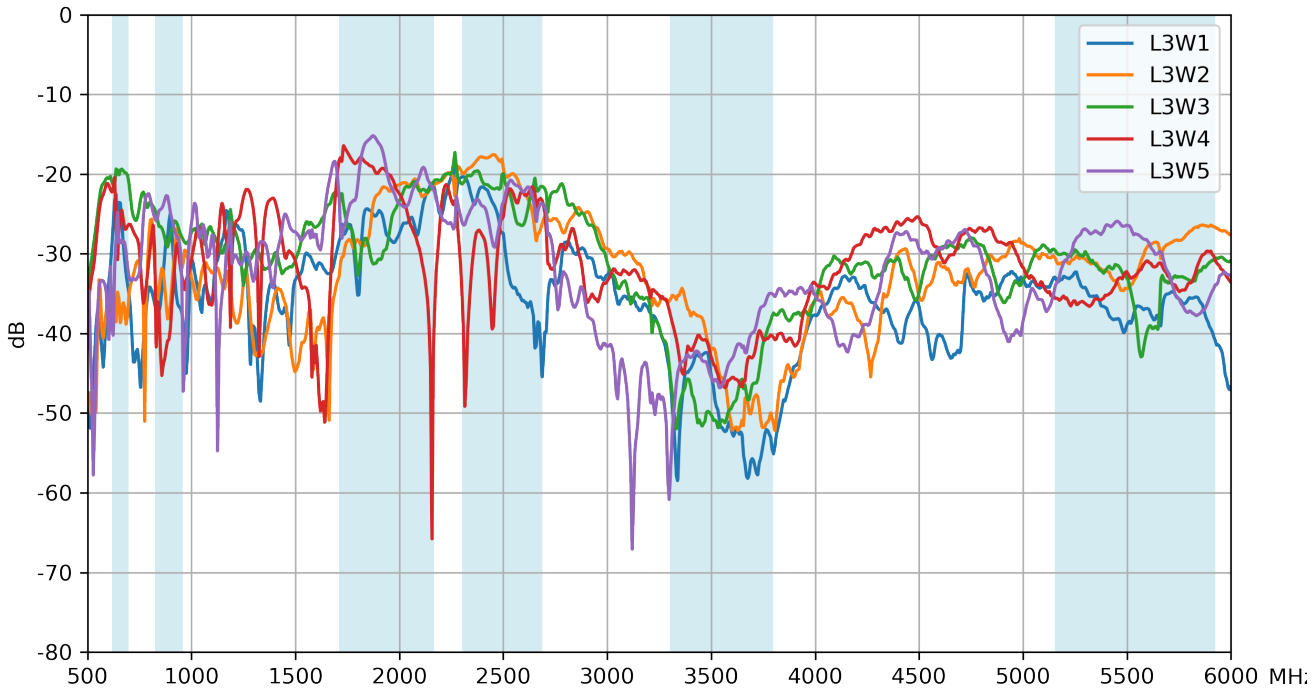
6.16 Isolation (4G/5G-1 – Wi-Fi)



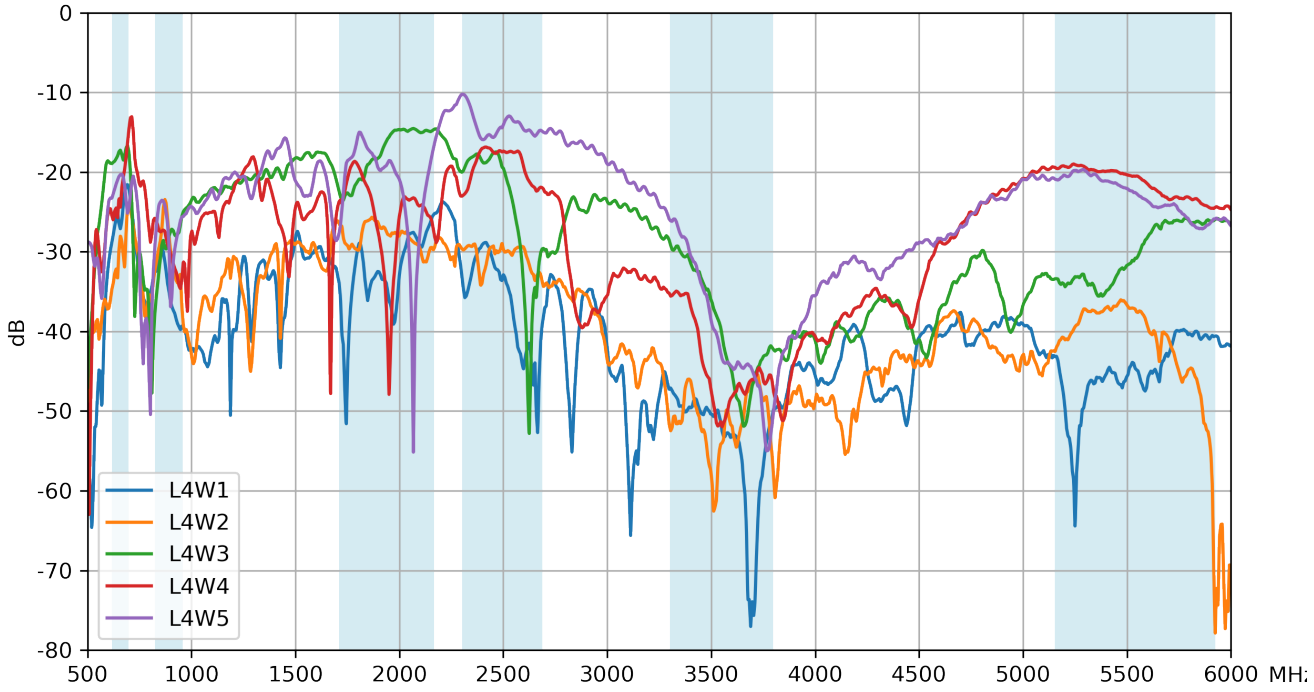
6.17 Isolation (4G/5G-2 – Wi-Fi))



6.18 Isolation (4G/5G-3 – Wi-Fi)

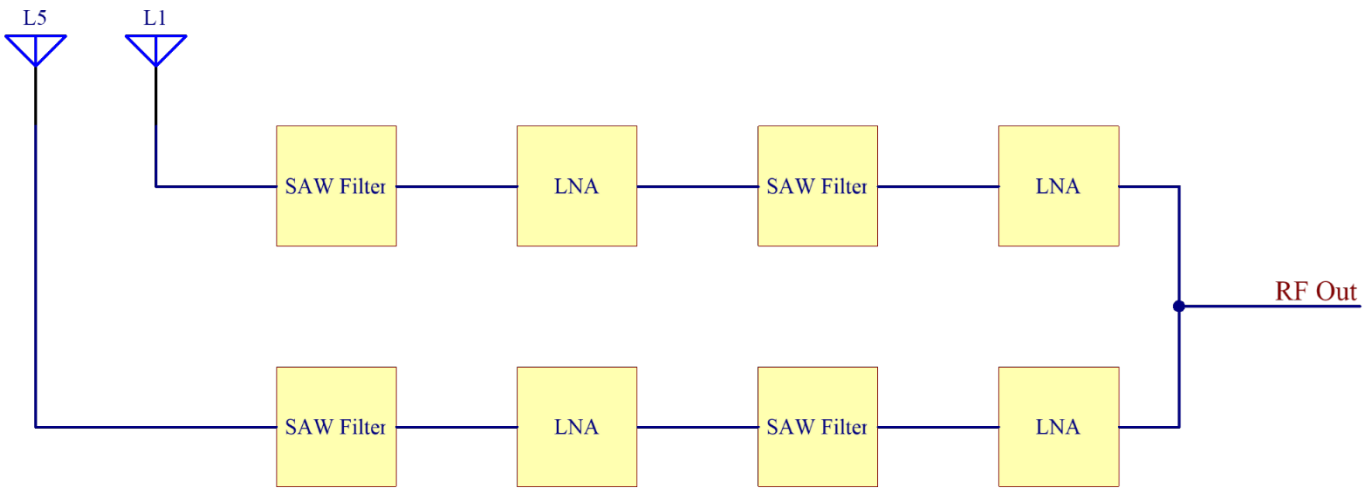


6.19 Isolation (4G/5G-4 – Wi-Fi))

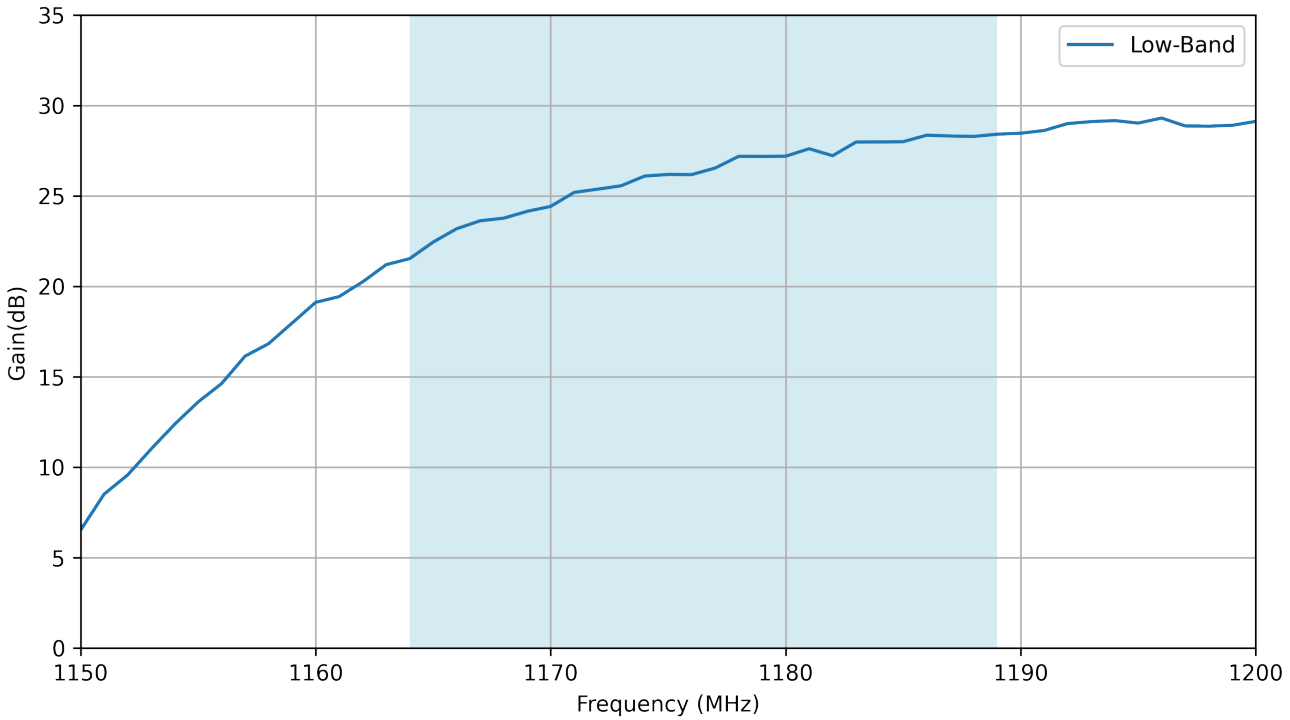


7. LNA Characteristics

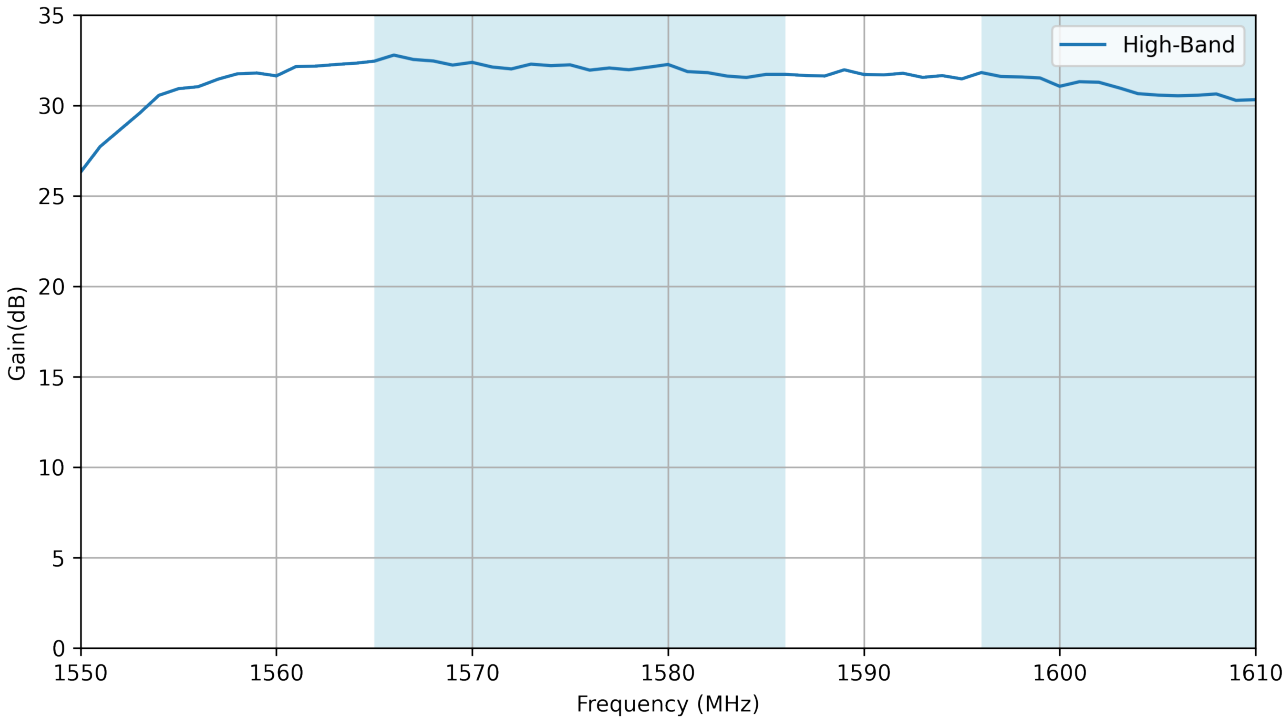
7.1 Block Diagram



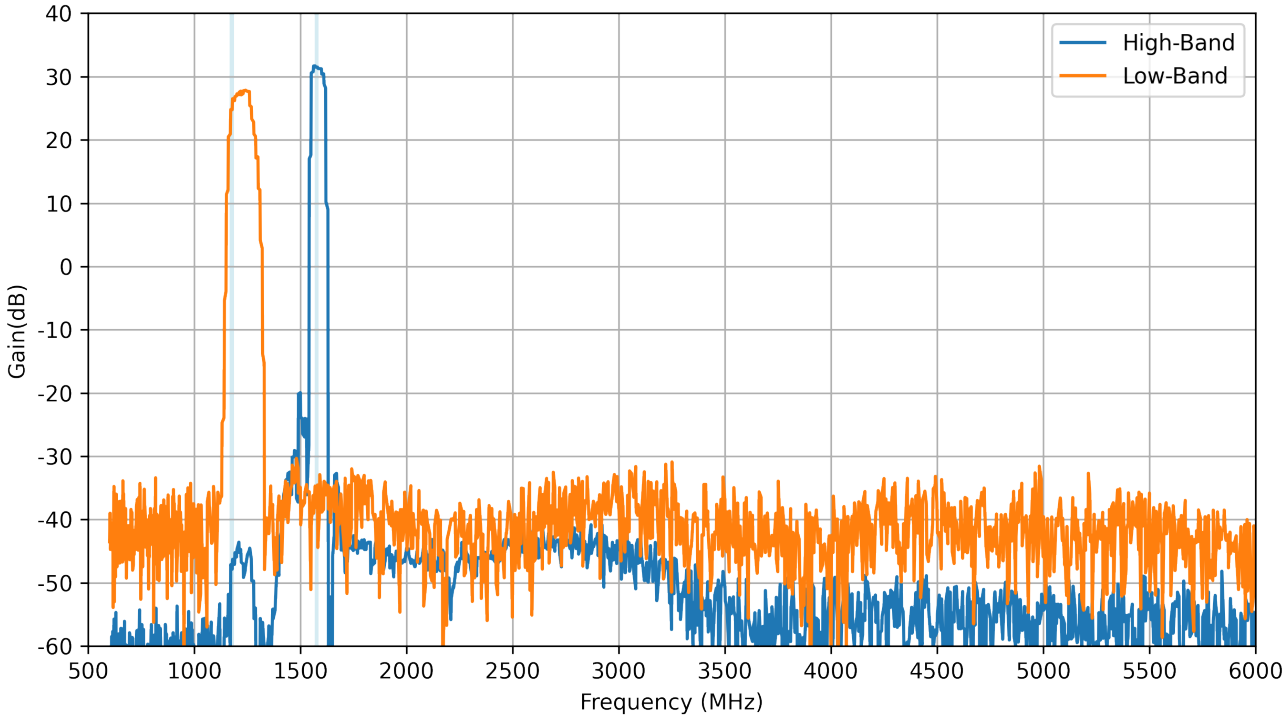
7.2 Gain – Low-Band



7.3 Gain – High-Band

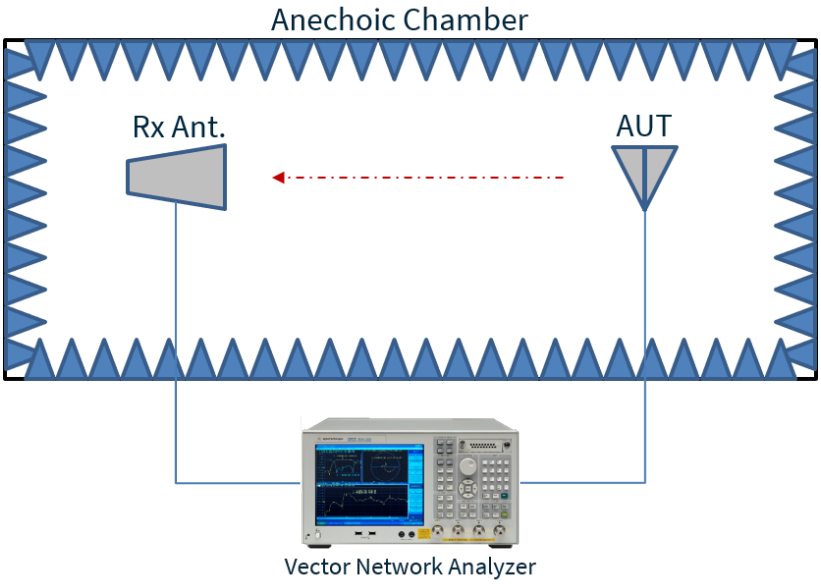


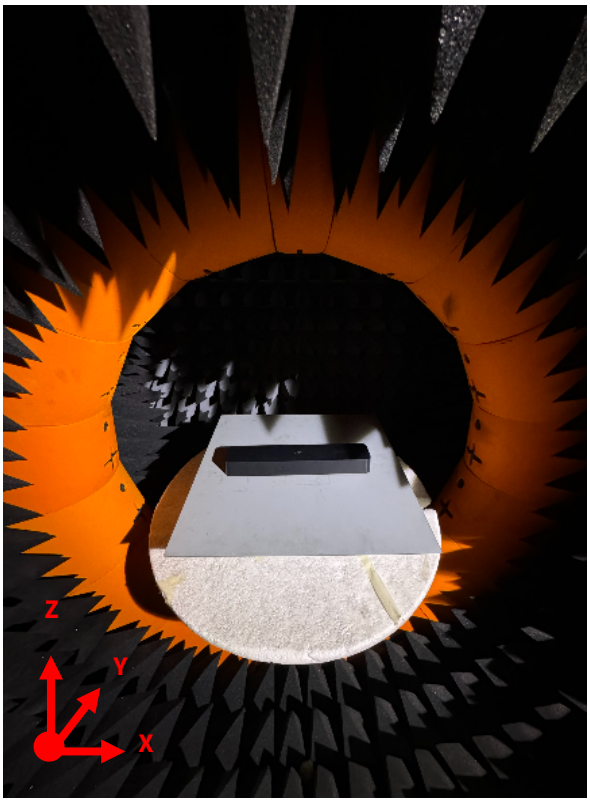
7.4 Out Of Band Attenuation



8. Radiation Patterns

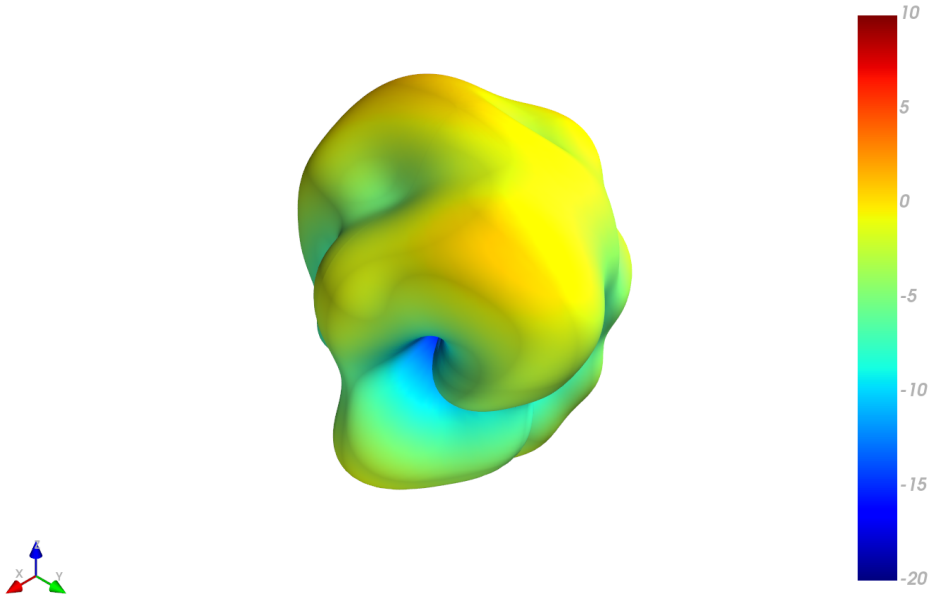
8.1 Test Setup



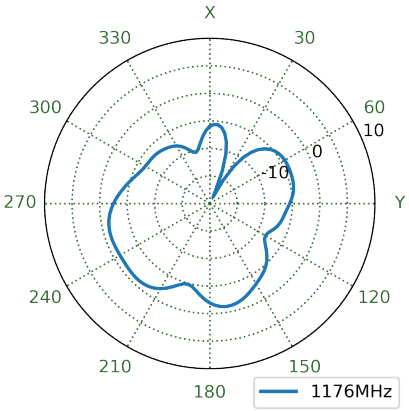


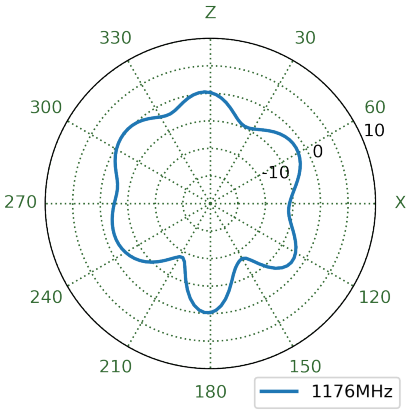
Chamber Test Set up

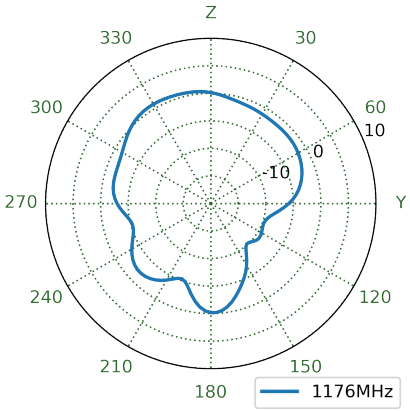
8.2 GNSS - Patterns at 1176 MHz



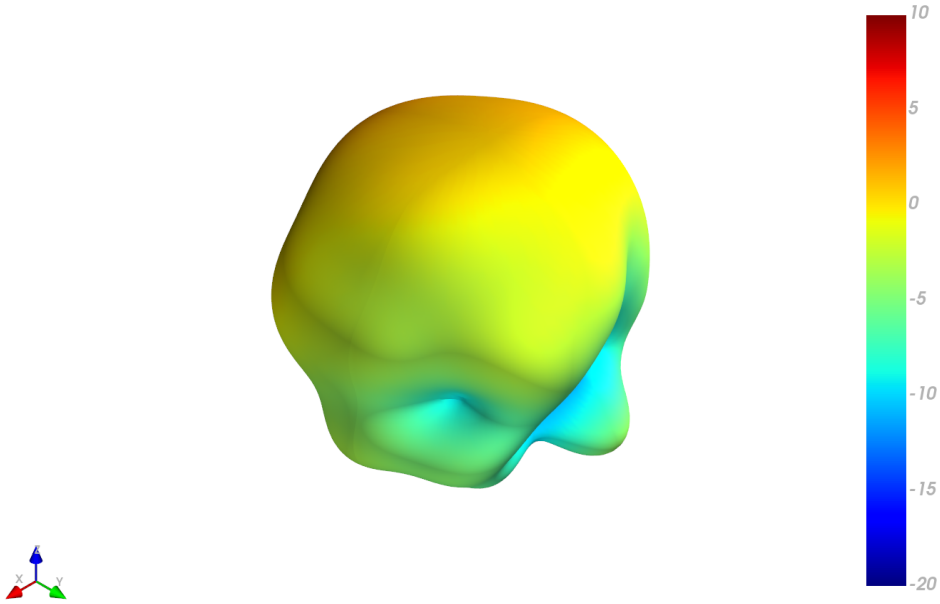
XY Plane	XZ Plane	YZ Plane



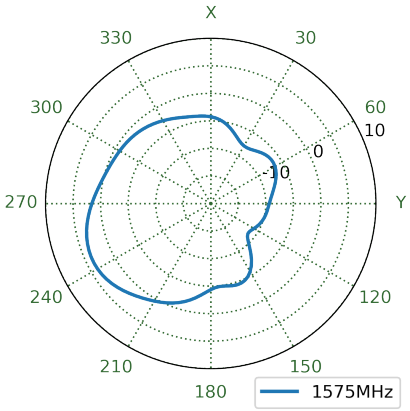


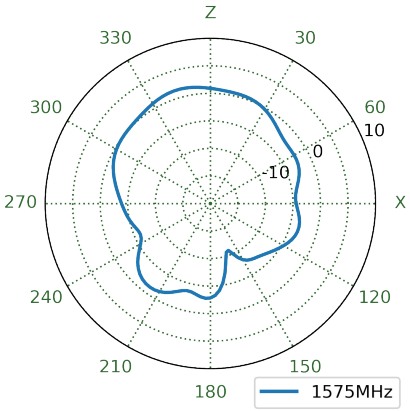


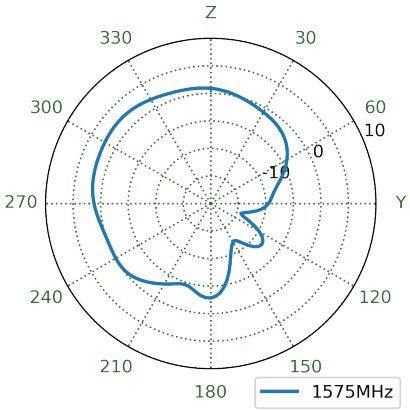
8.3 GNSS - Patterns at 1575 MHz



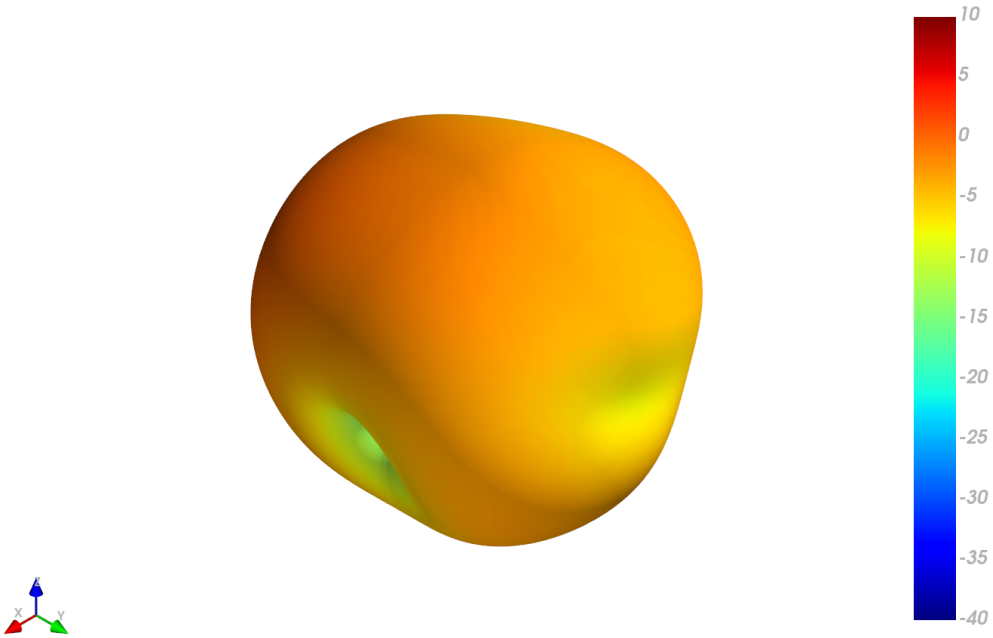
XY Plane	XZ Plane	YZ Plane

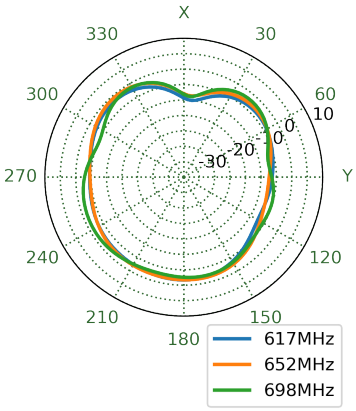
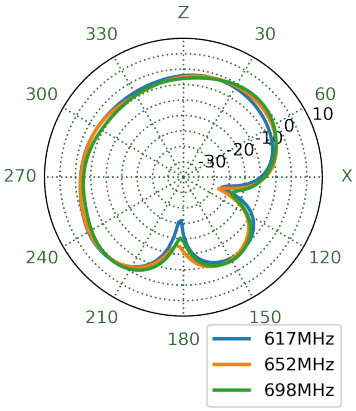
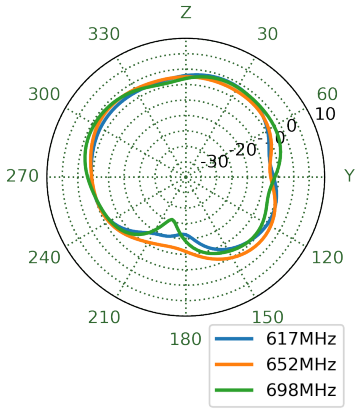




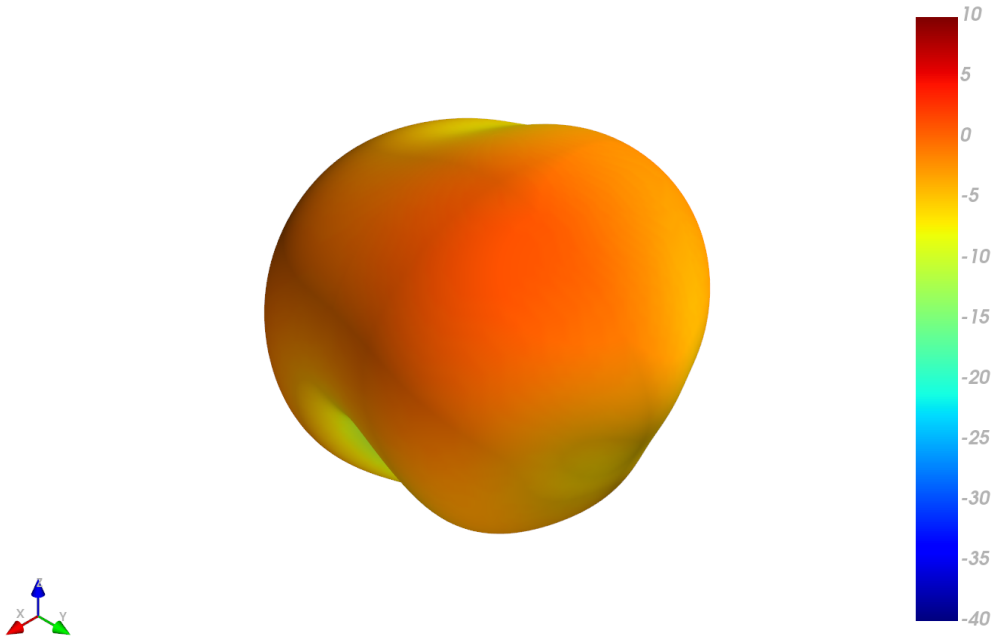


8.4 4G/5G-1 - Patterns at 652 MHz

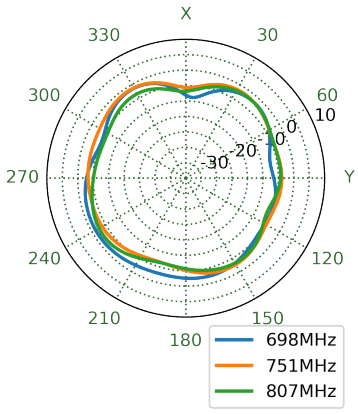


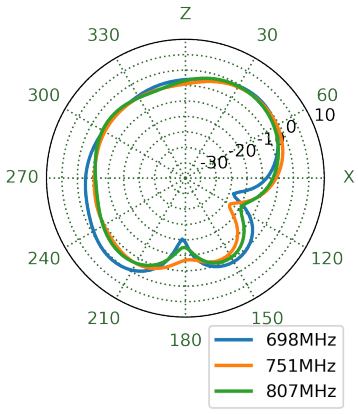
XY Plane	XZ Plane	YZ Plane
		

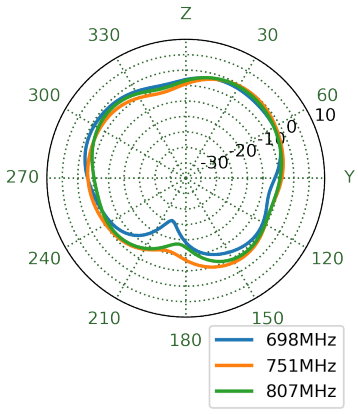
8.5 4G/5G-1 - Patterns at 751 MHz



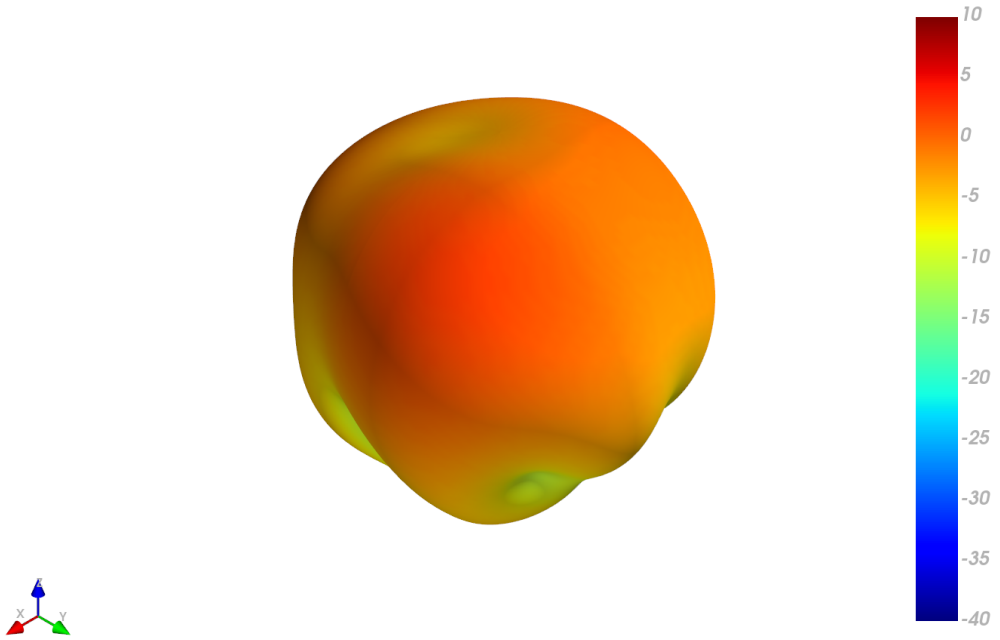
XY Plane	XZ Plane	YZ Plane

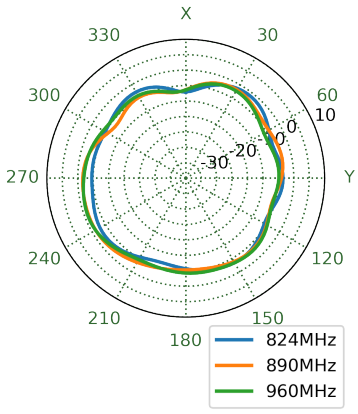
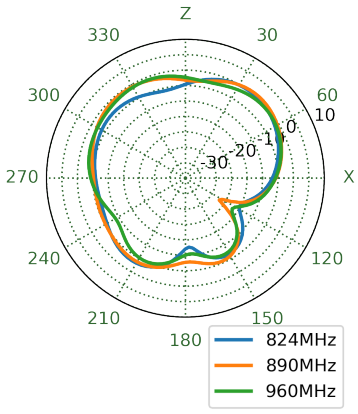
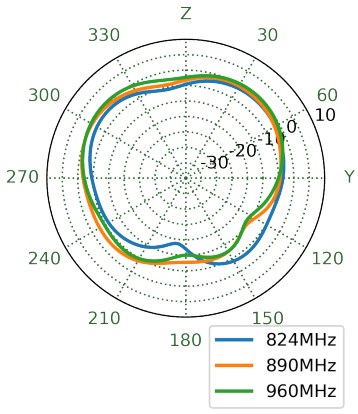




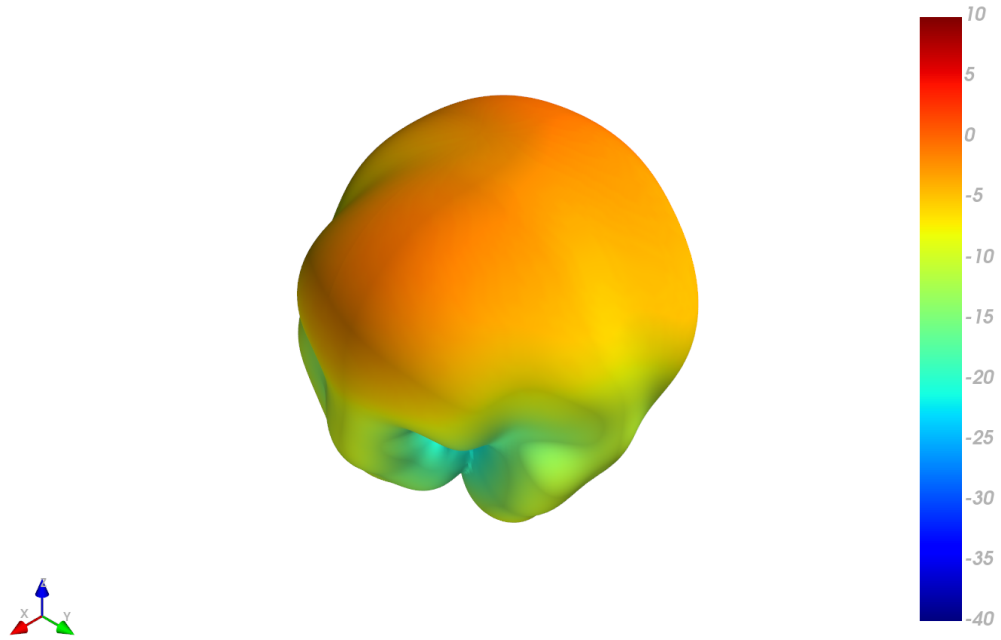


8.6 4G/5G-1 - Patterns at 890 MHz

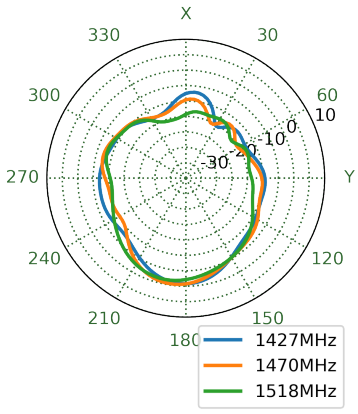


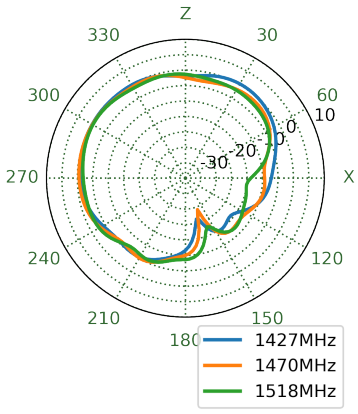
XY Plane	XZ Plane	YZ Plane
		

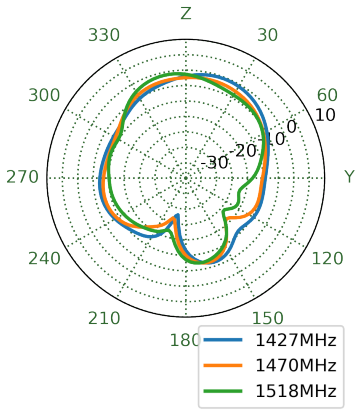
8.7 4G/5G-1 - Patterns at 1470 MHz



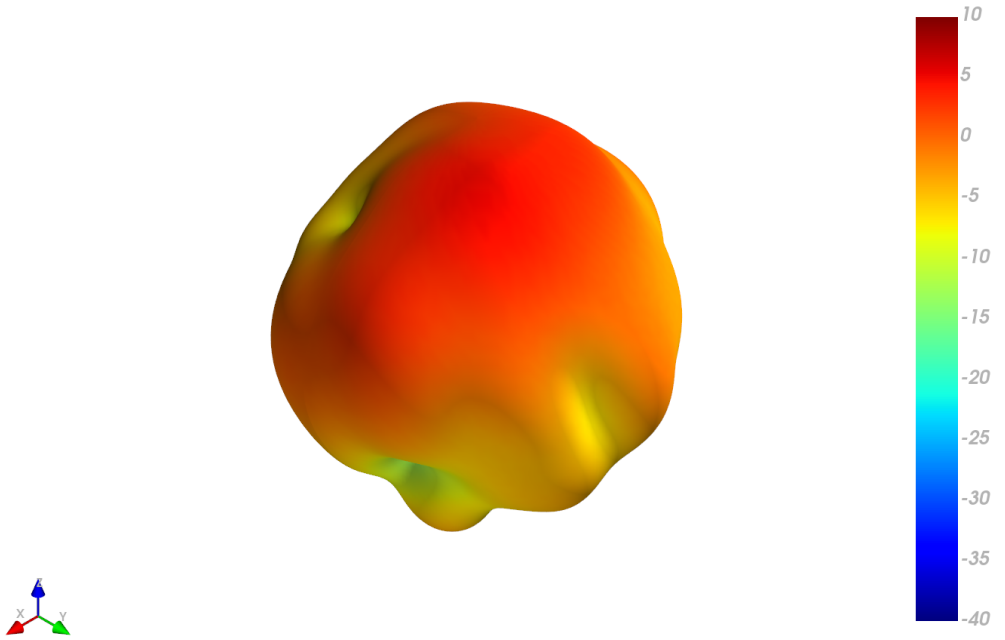
XY Plane	XZ Plane	YZ Plane



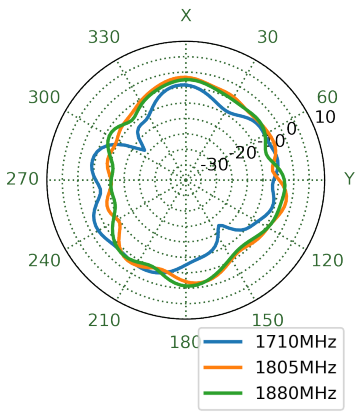


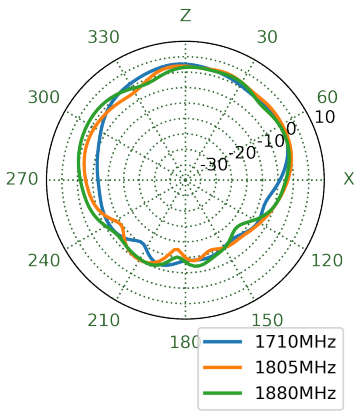


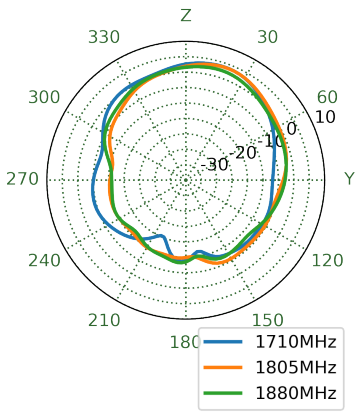
8.8 4G/5G-1 - Patterns at 1805 MHz



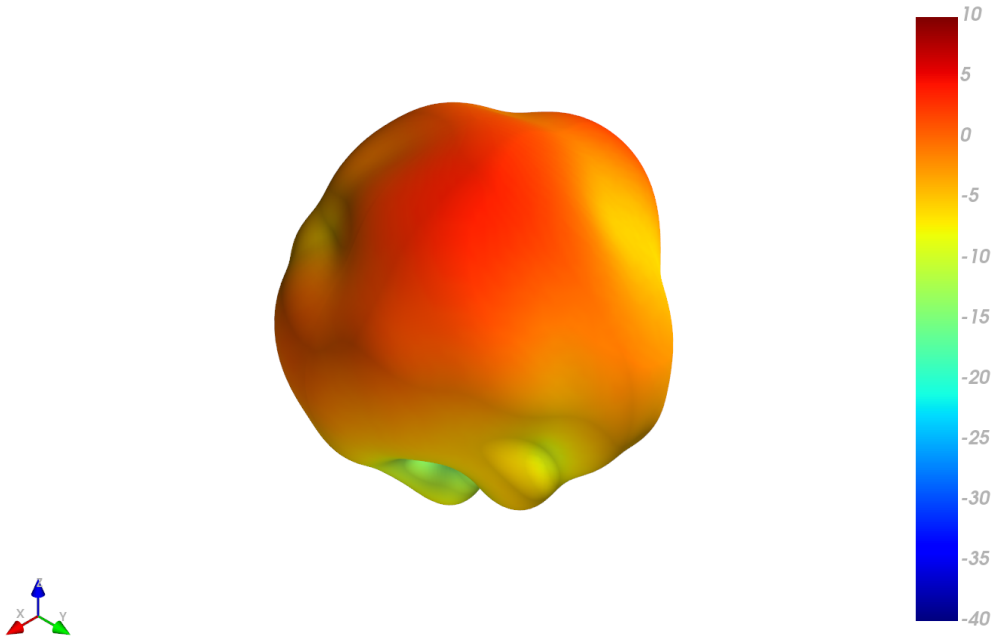
XY Plane	XZ Plane	YZ Plane



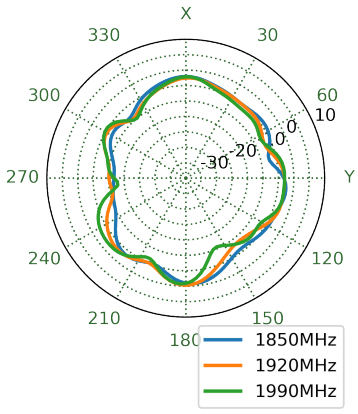


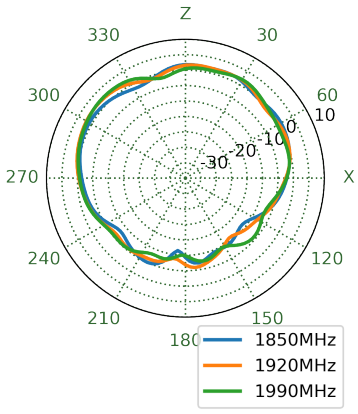


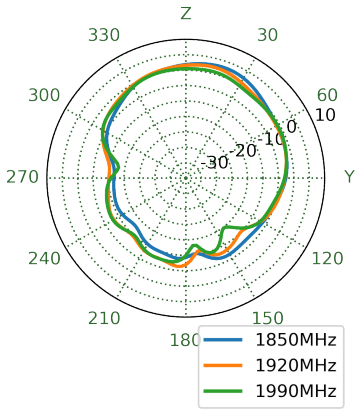
8.9 4G/5G-1 - Patterns at 1920 MHz



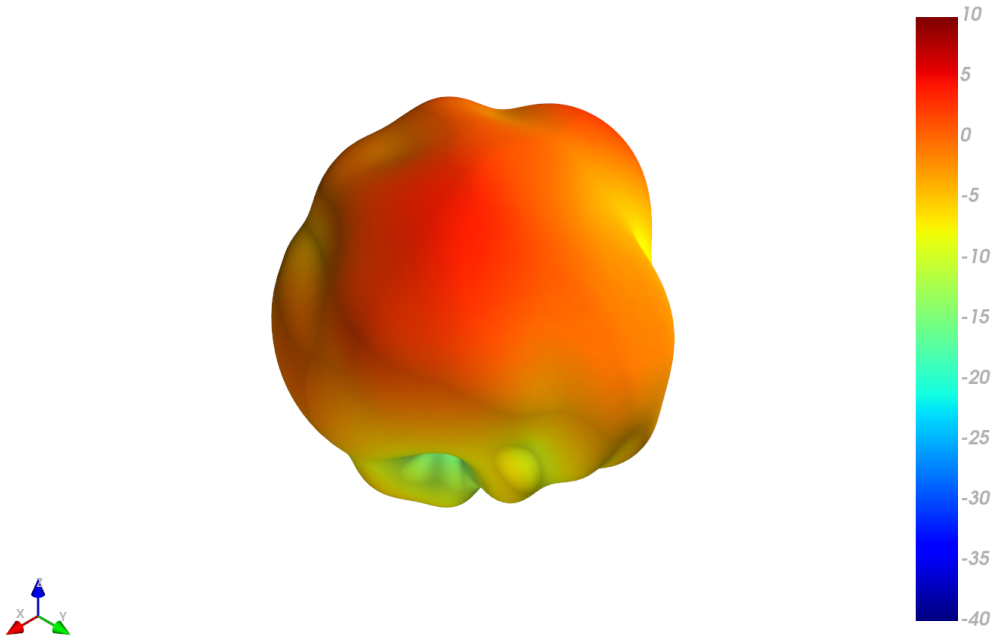
XY Plane	XZ Plane	YZ Plane



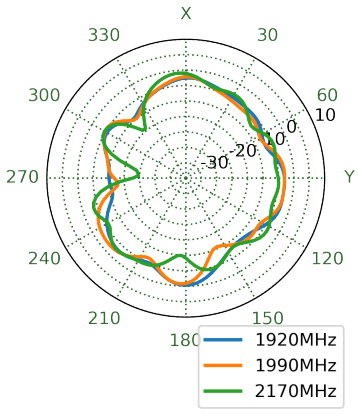


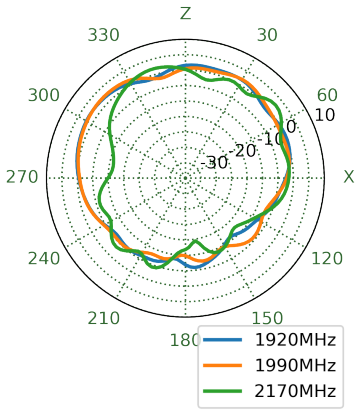


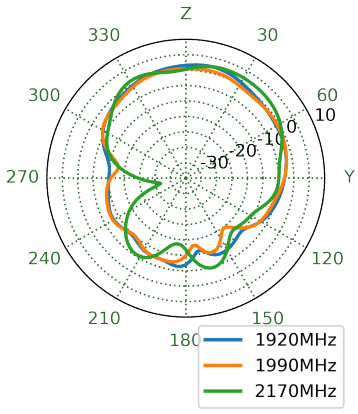
8.10 4G/5G-1 - Patterns at 1990 MHz



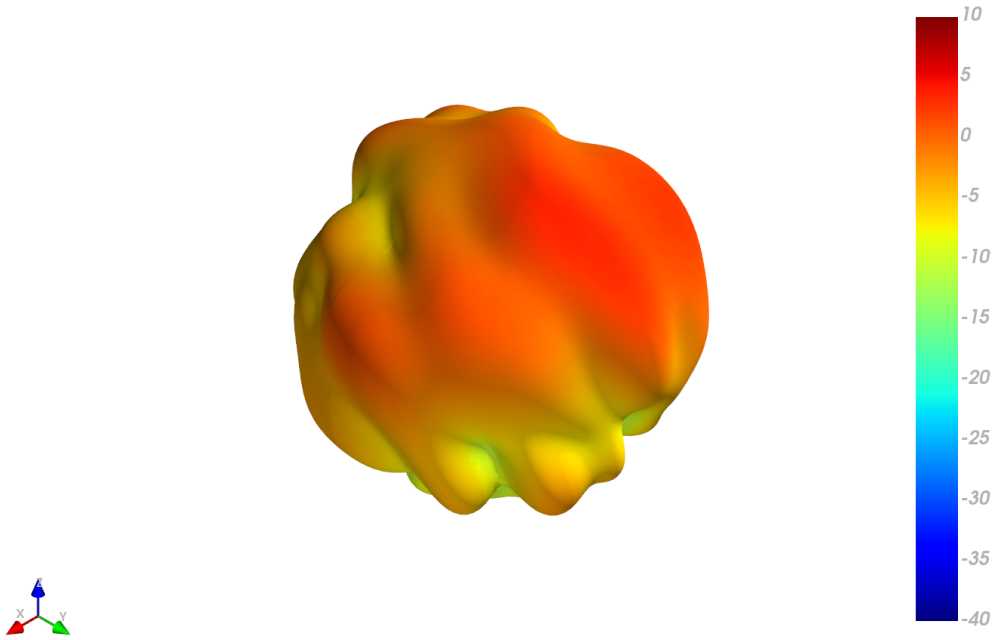
XY Plane	XZ Plane	YZ Plane



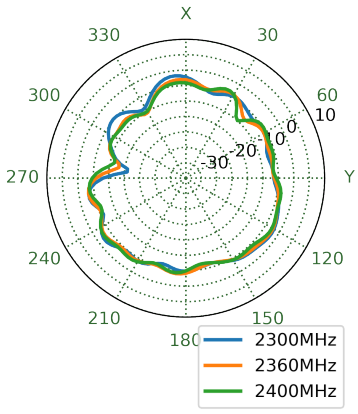


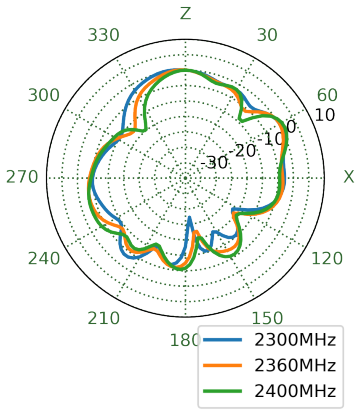


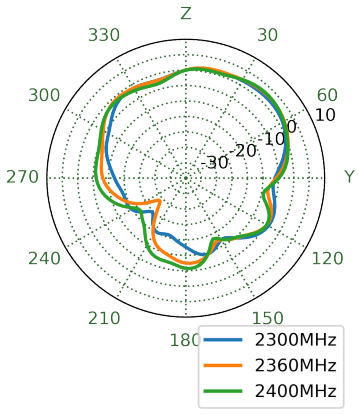
8.11 4G/5G-1 - Patterns at 2360 MHz



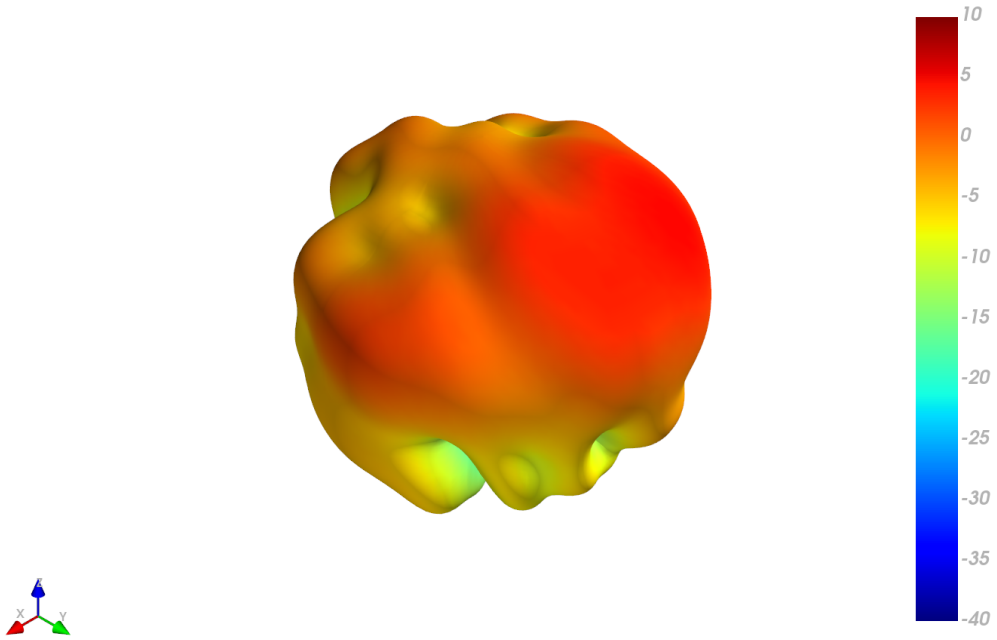
XY Plane	XZ Plane	YZ Plane



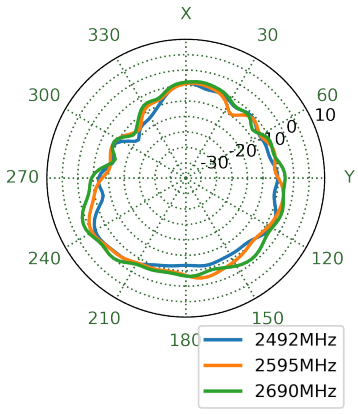


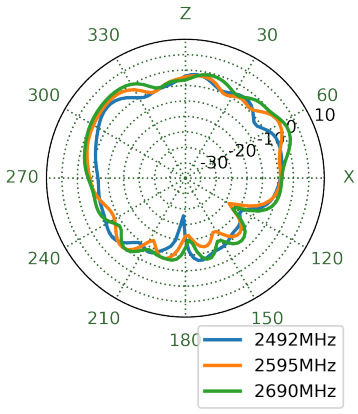


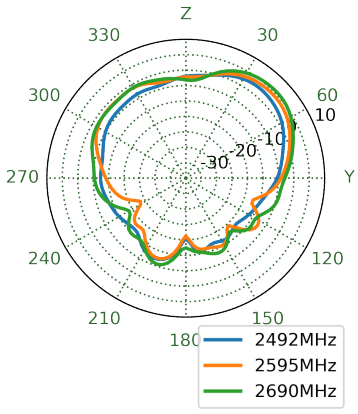
8.12 4G/5G-1 - Patterns at 2595 MHz



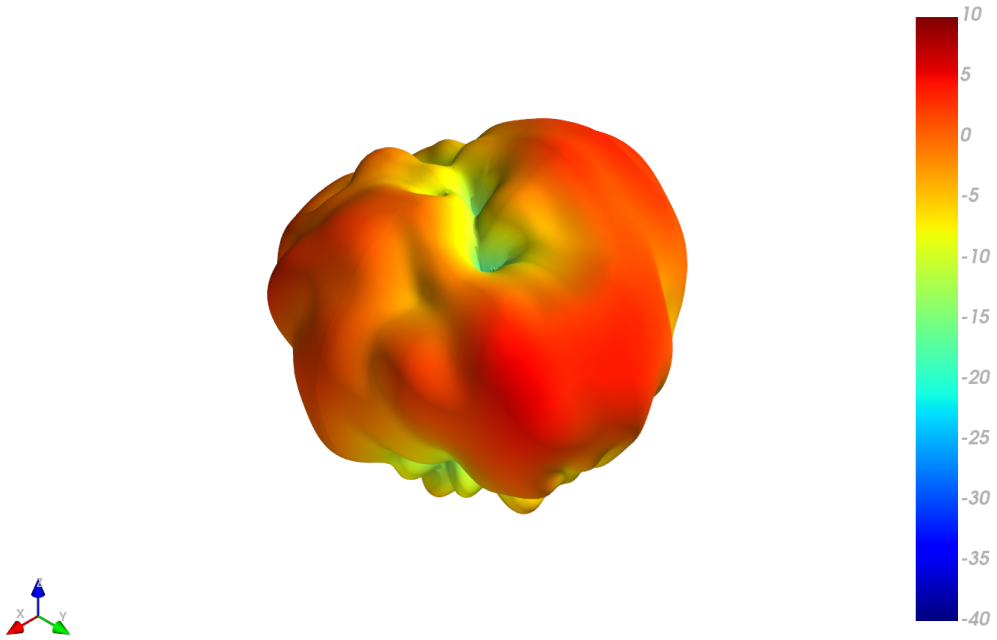
XY Plane	XZ Plane	YZ Plane



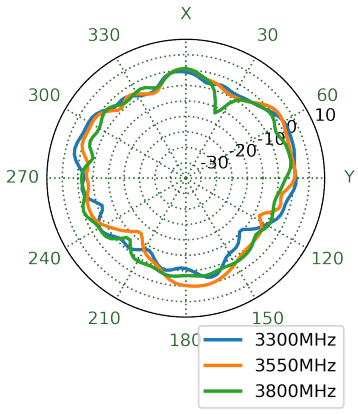


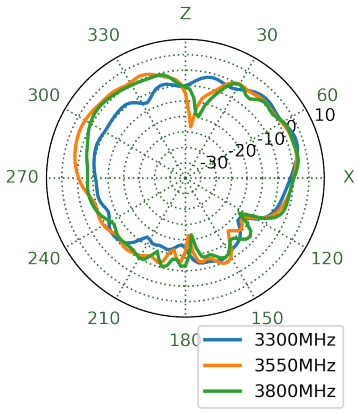


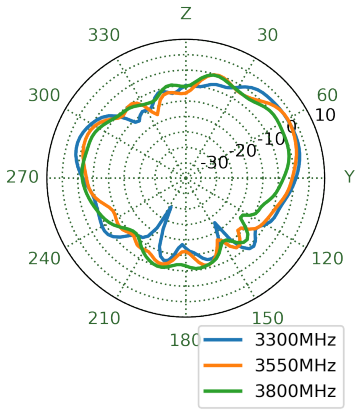
8.13 4G/5G-1 - Patterns at 3550 MHz



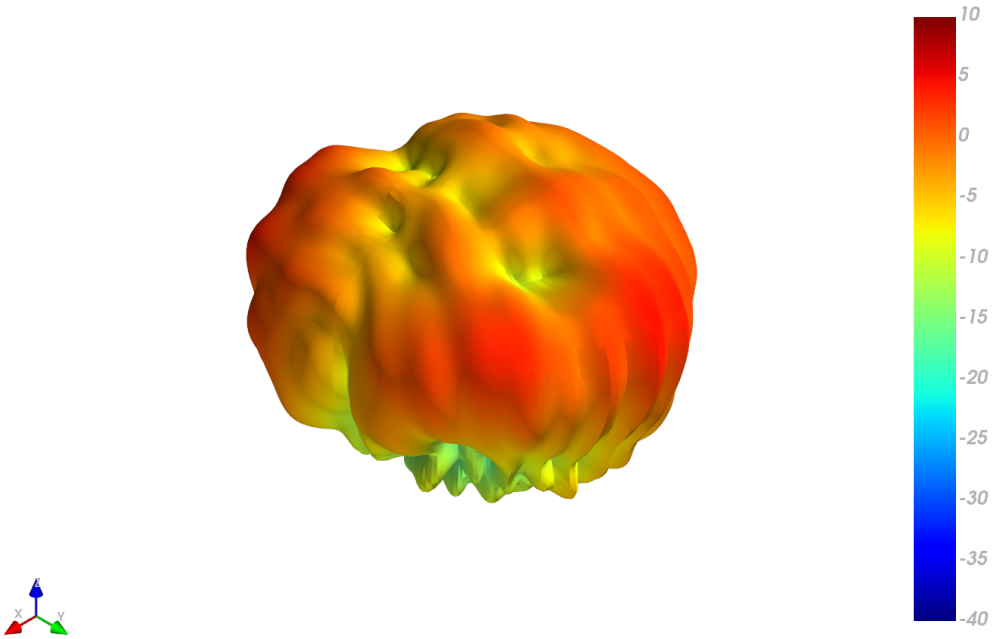
XY Plane	XZ Plane	YZ Plane



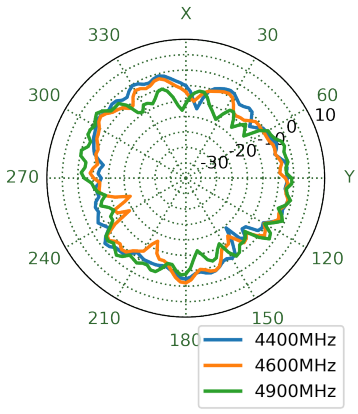


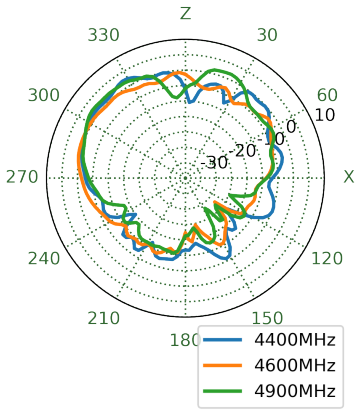


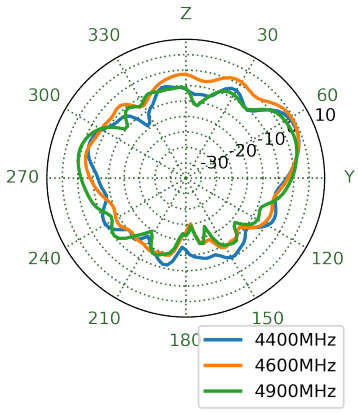
8.14 4G/5G-1 - Patterns at 4600 MHz



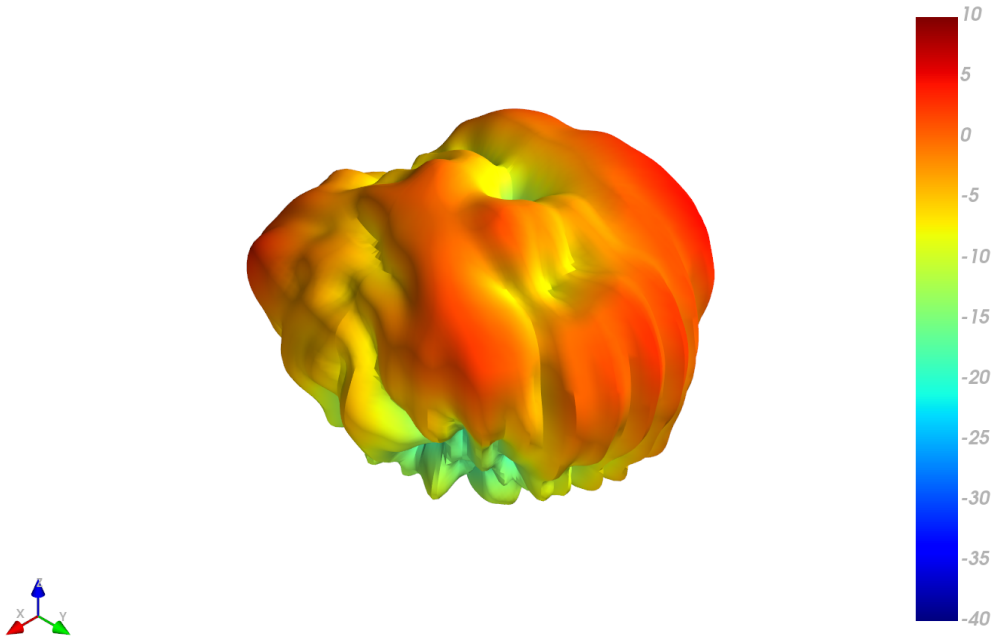
XY Plane	XZ Plane	YZ Plane



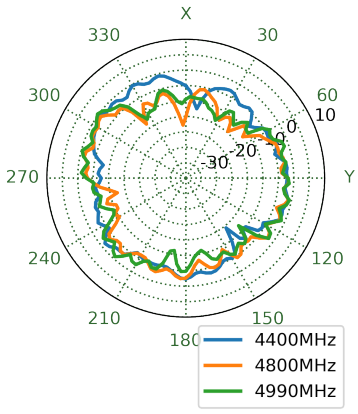


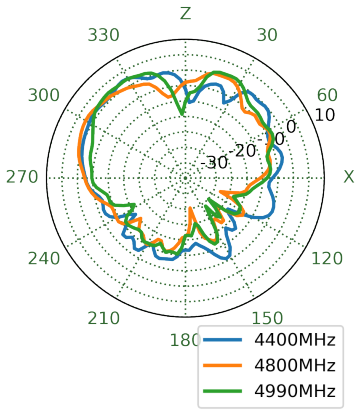


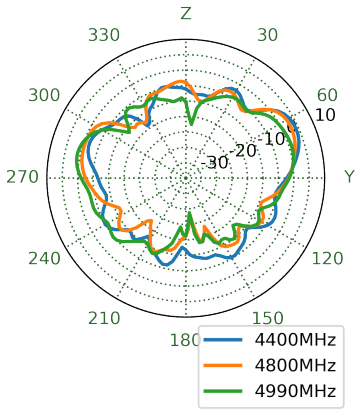
8.15 4G/5G-1 - Patterns at 4800 MHz



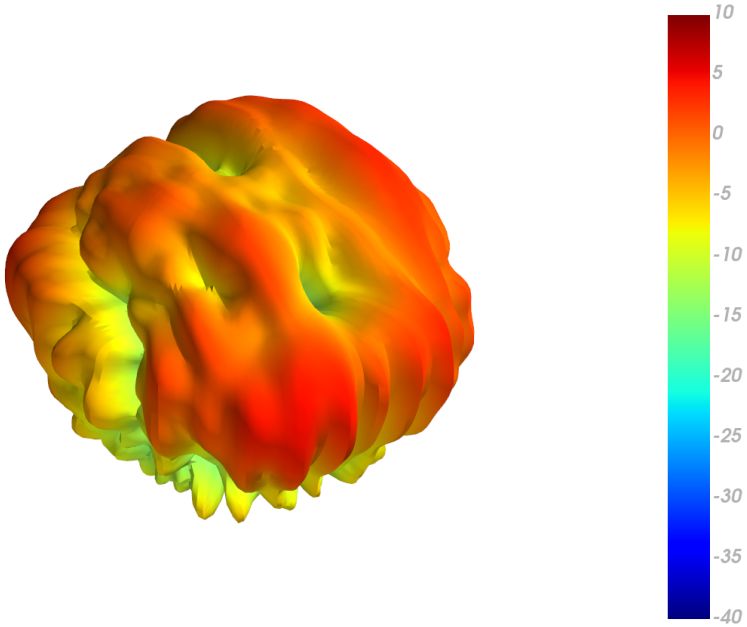
XY Plane	XZ Plane	YZ Plane



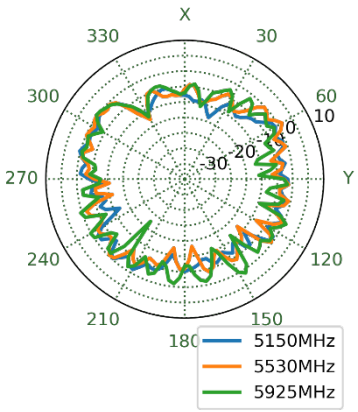


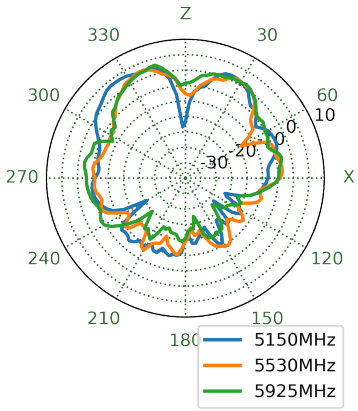


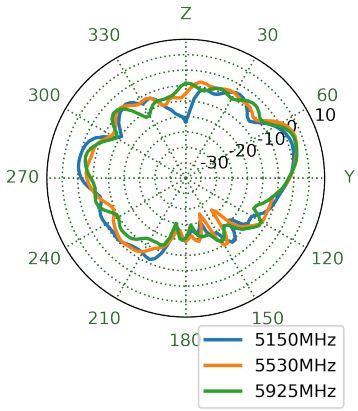
8.16 4G/5G-1 - Patterns at 5530 MHz



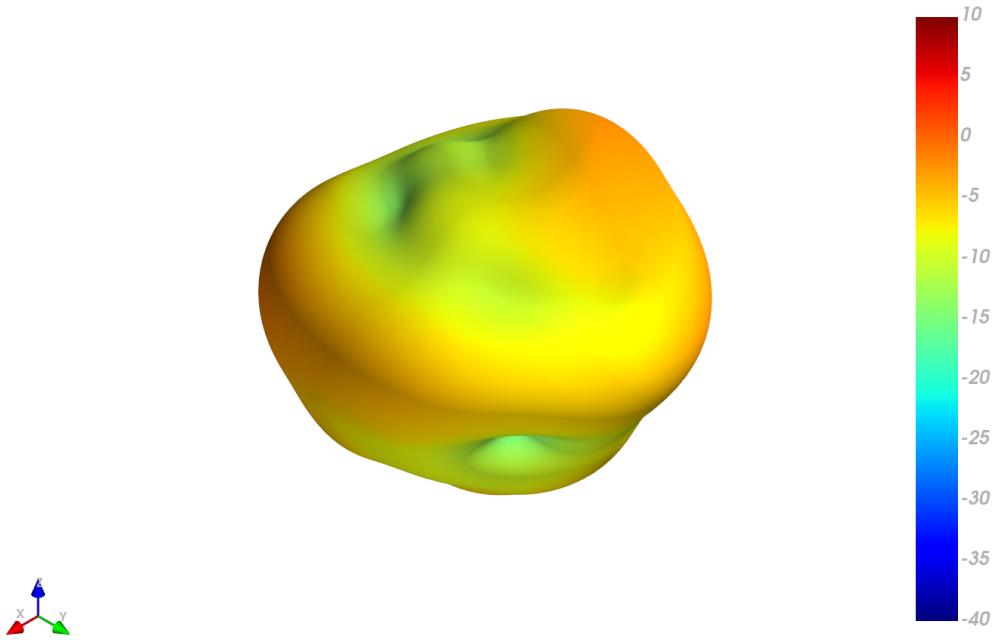
XY Plane	XZ Plane	YZ Plane

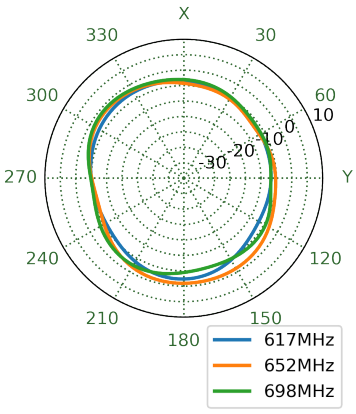
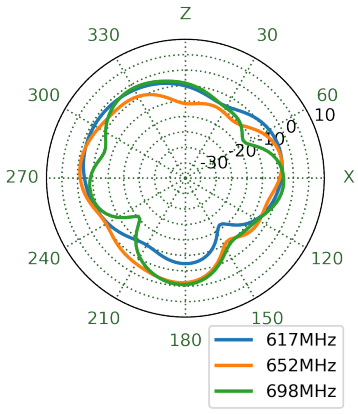
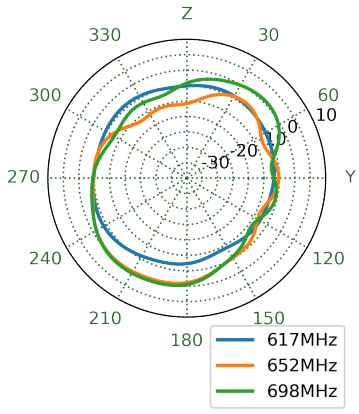




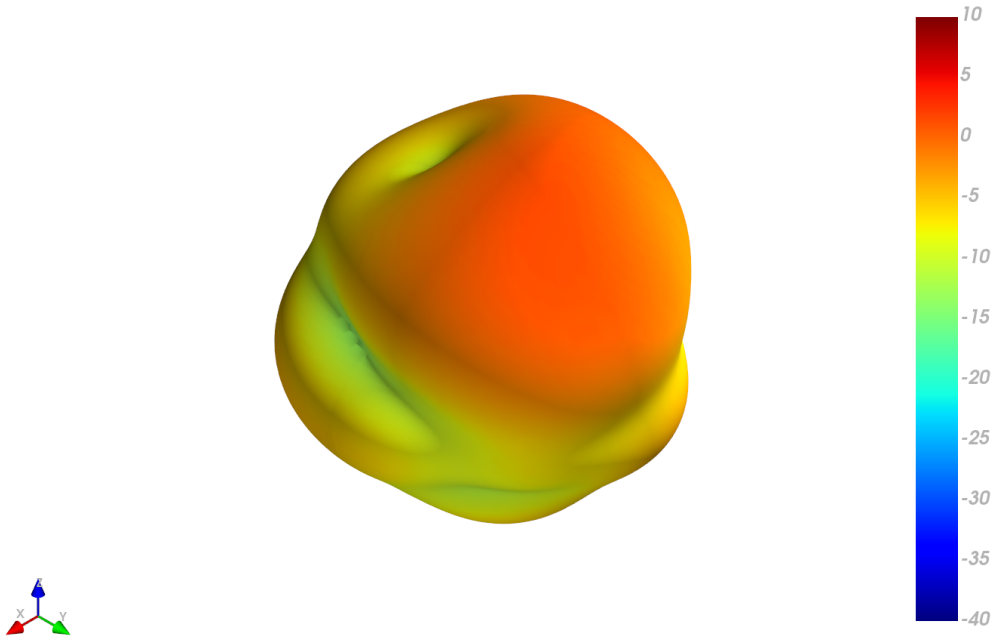


8.17 4G/5G-2 - Patterns at 652 MHz

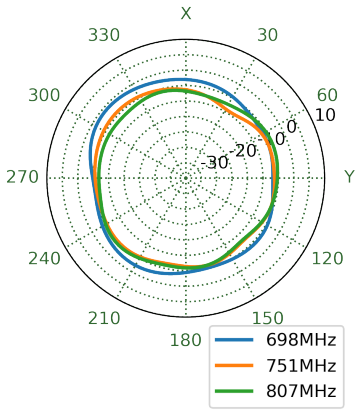


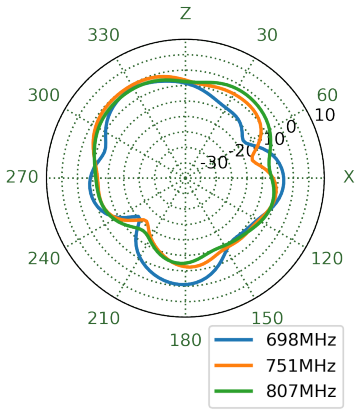
XY Plane	XZ Plane	YZ Plane
		

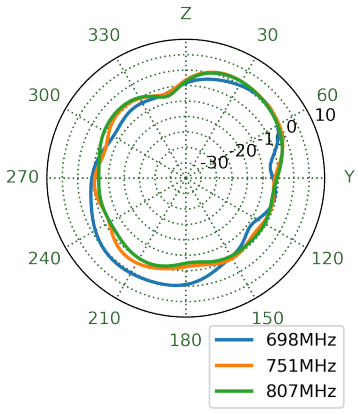
8.18 4G/5G-2 - Patterns at 751 MHz



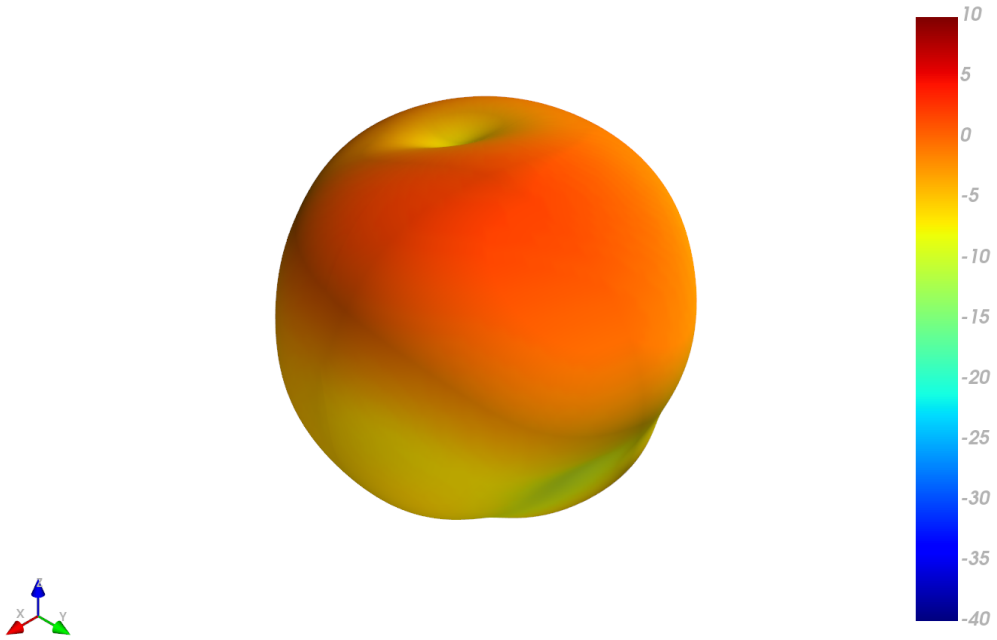
XY Plane	XZ Plane	YZ Plane



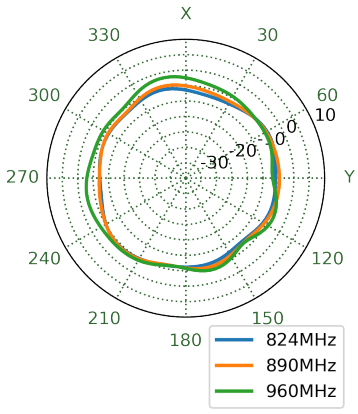


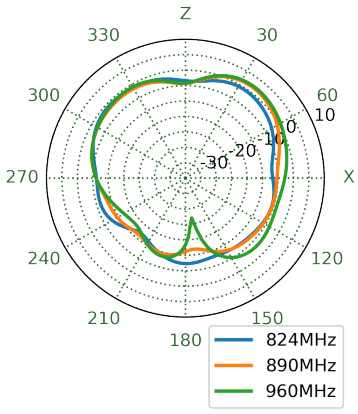


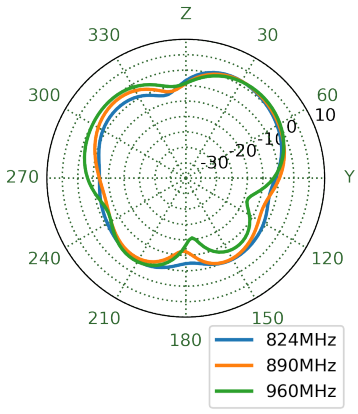
8.19 4G/5G-2 - Patterns at 890 MHz



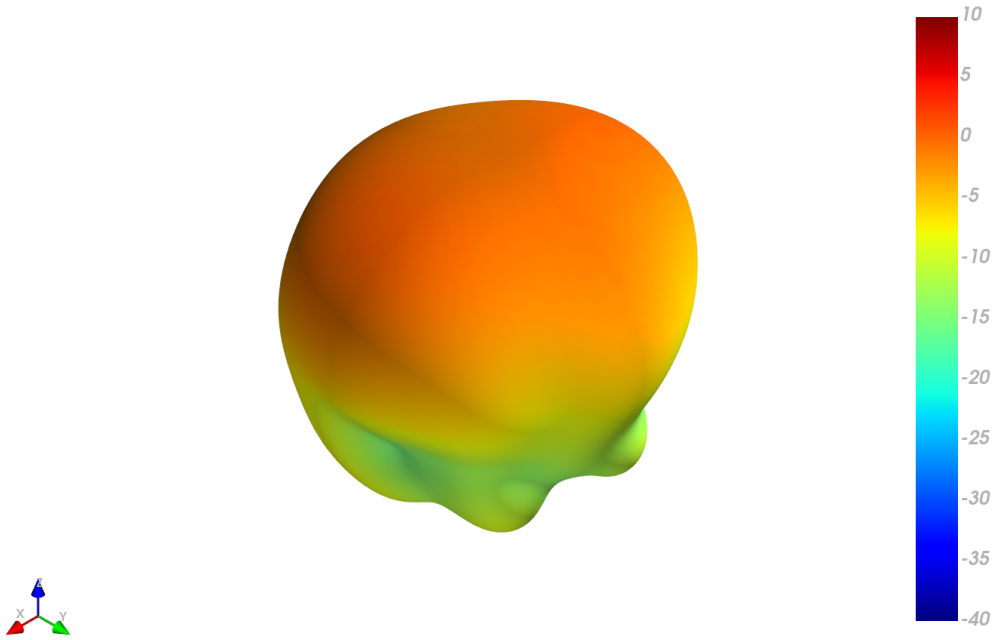
XY Plane	XZ Plane	YZ Plane



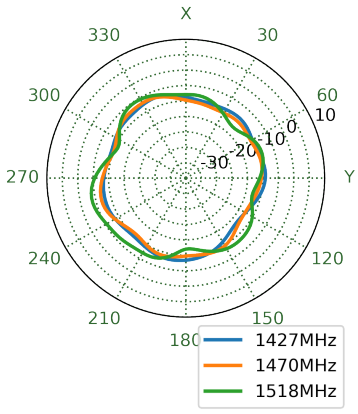


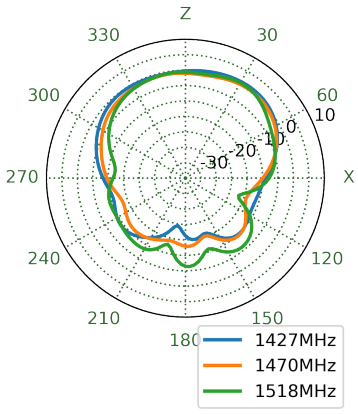


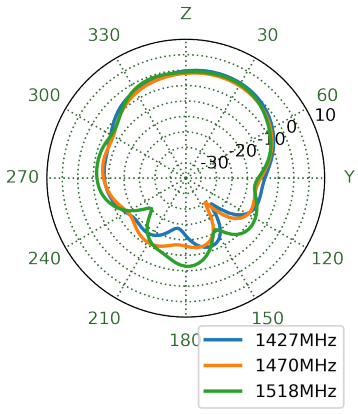
8.20 4G/5G-2 - Patterns at 1470 MHz



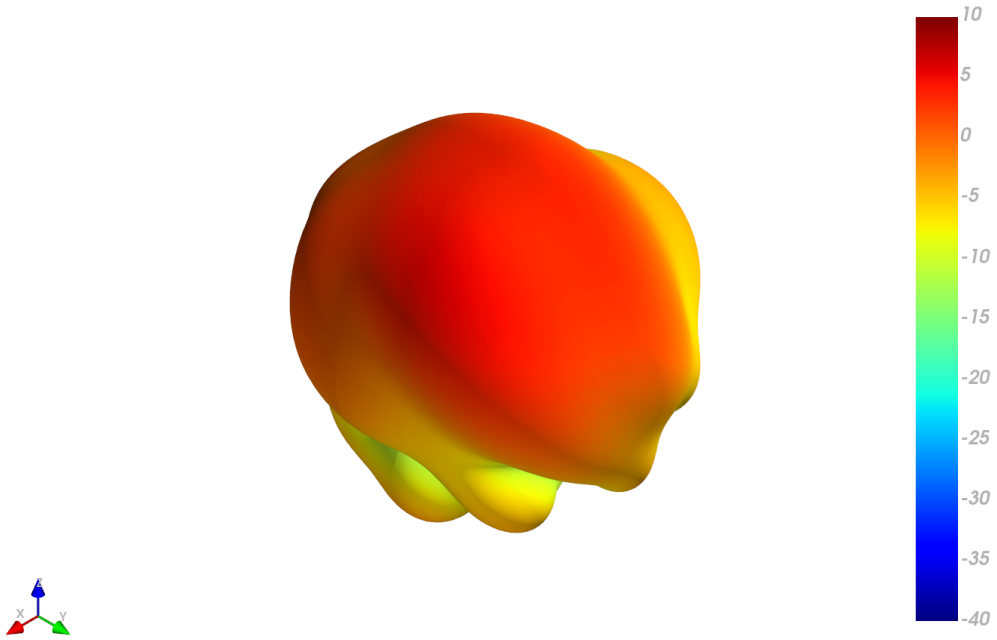
XY Plane	XZ Plane	YZ Plane



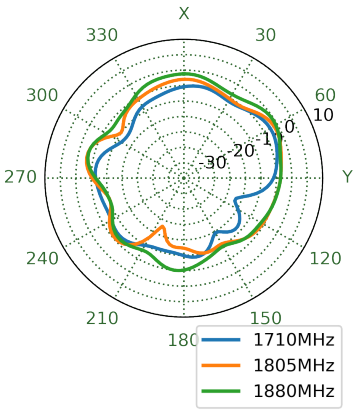


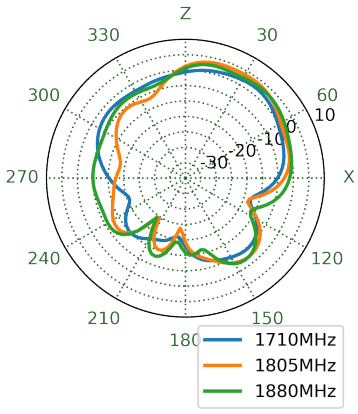


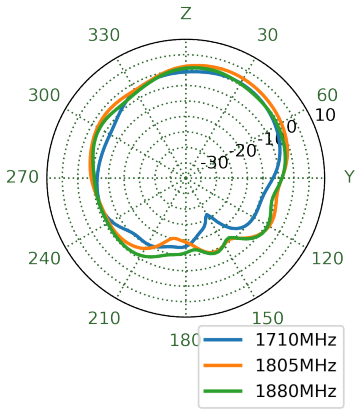
8.21 4G/5G-2 - Patterns at 1805 MHz



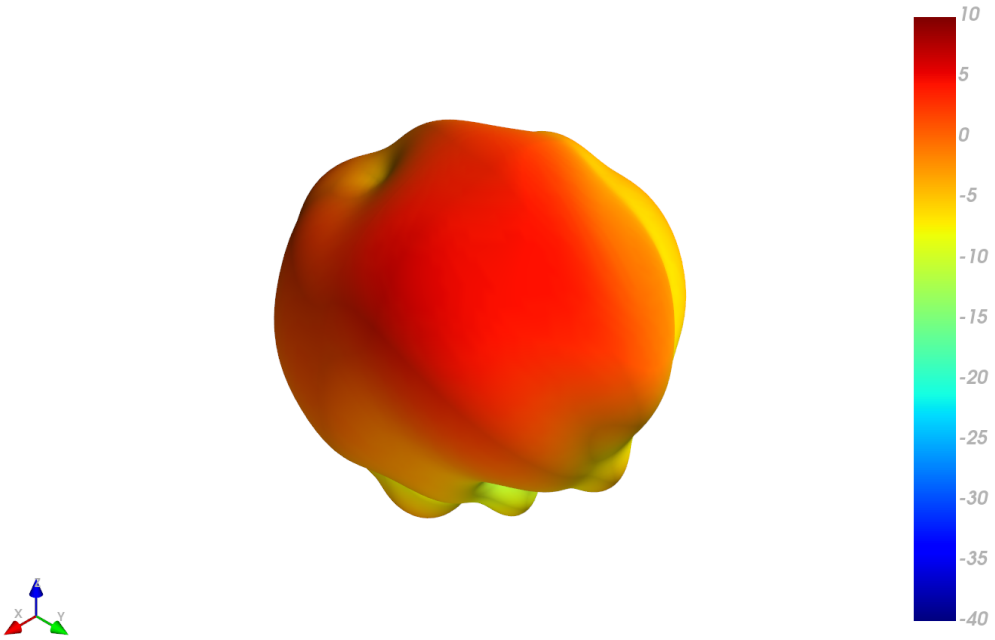
XY Plane	XZ Plane	YZ Plane



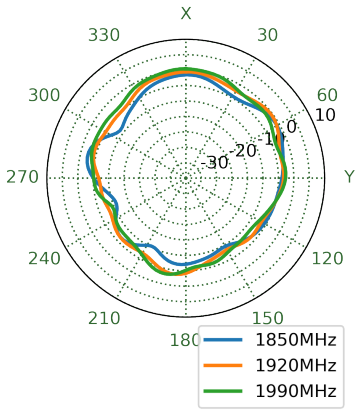


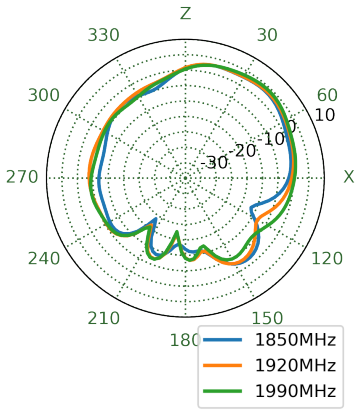


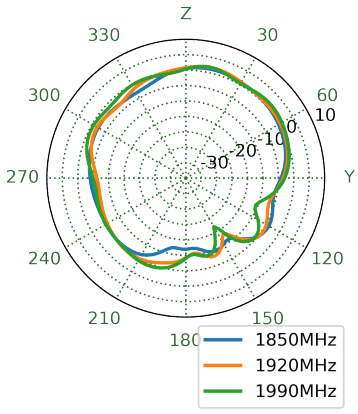
8.22 4G/5G-2 - Patterns at 1920 MHz



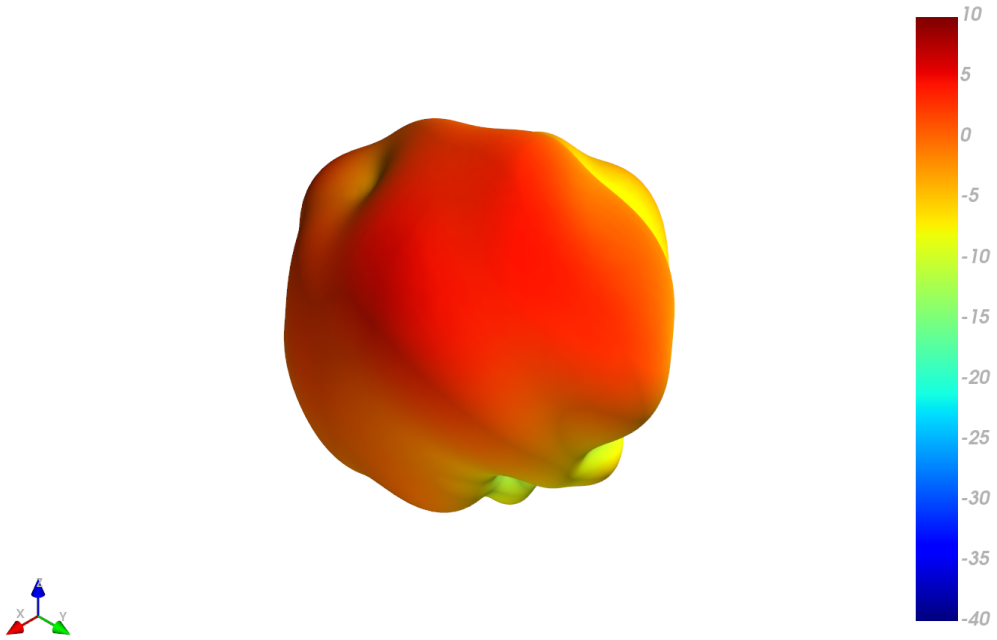
XY Plane	XZ Plane	YZ Plane



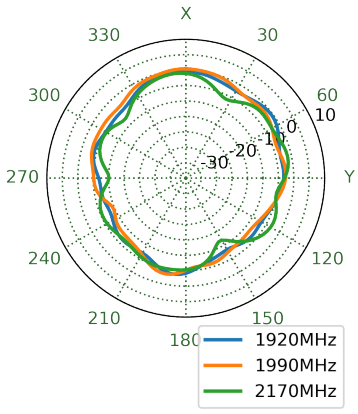


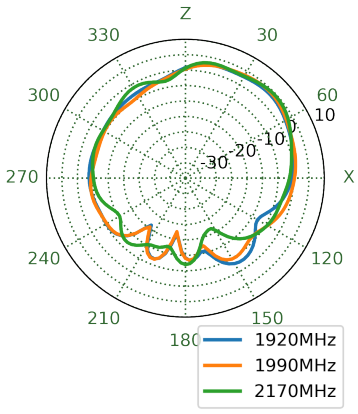


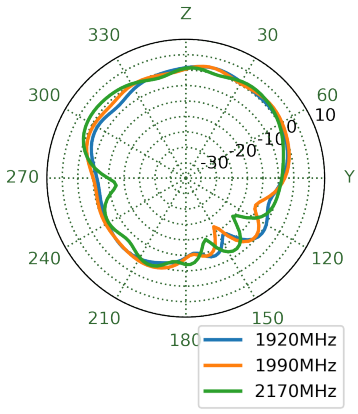
8.23 4G/5G-2 - Patterns at 1990 MHz



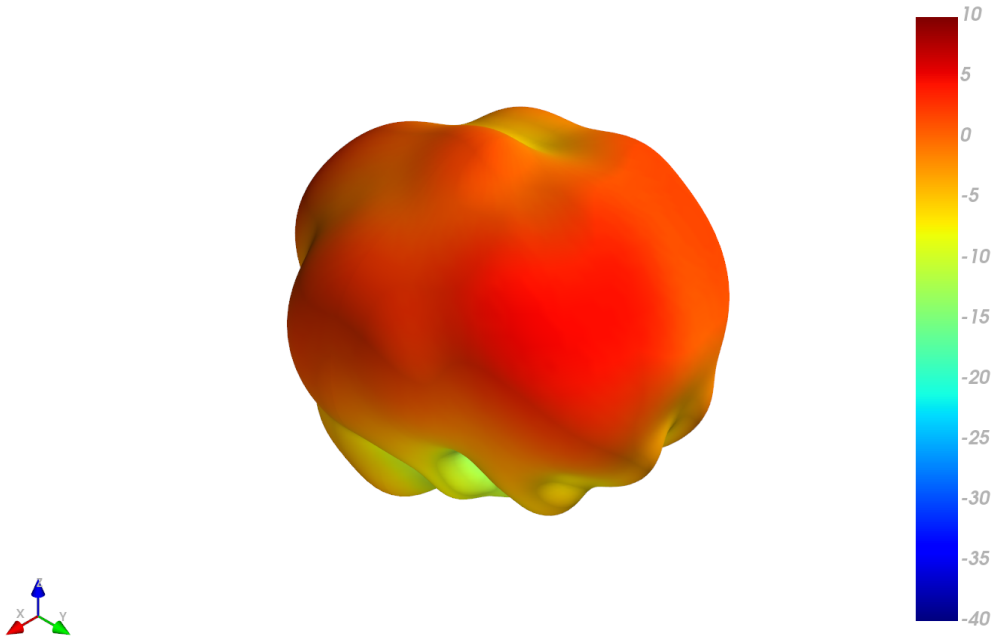
XY Plane	XZ Plane	YZ Plane

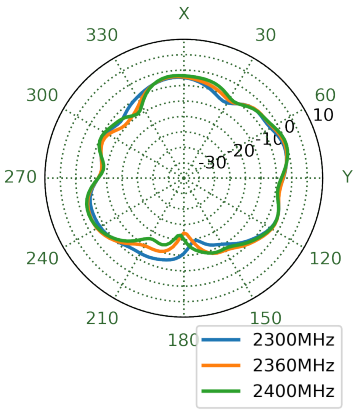
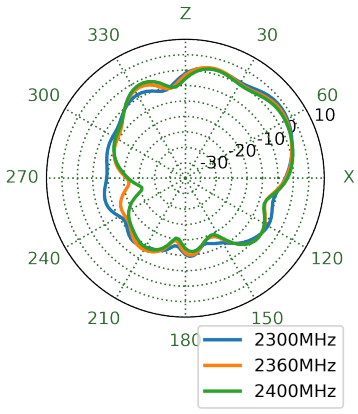
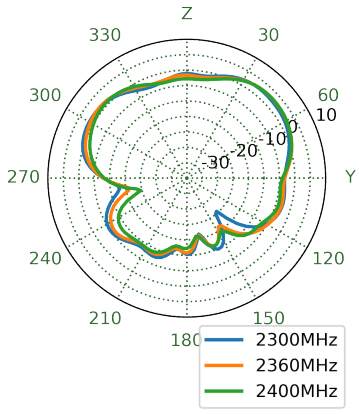




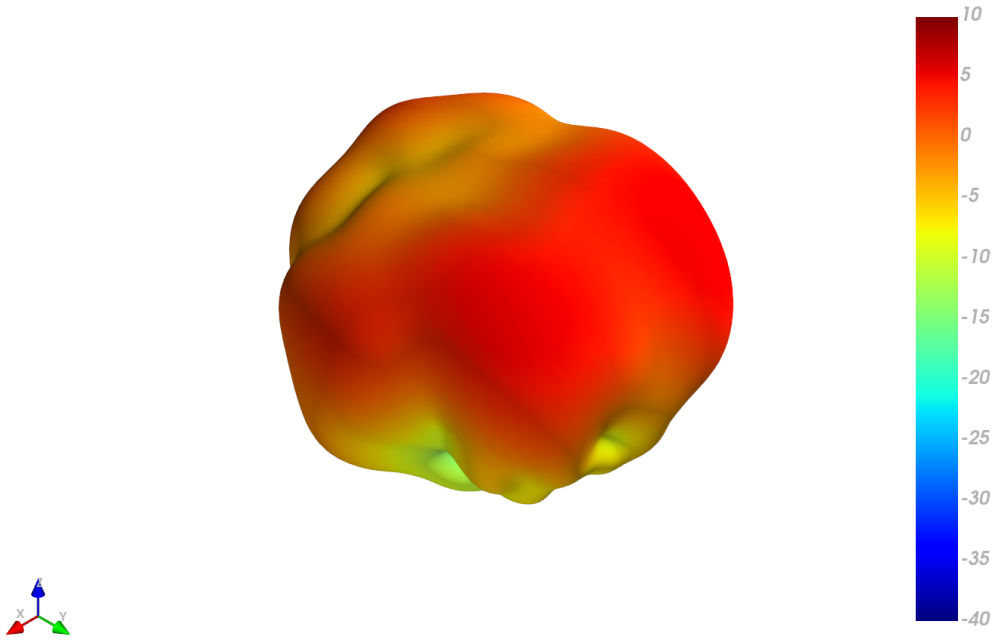


8.24 4G/5G-2 - Patterns at 2360 MHz

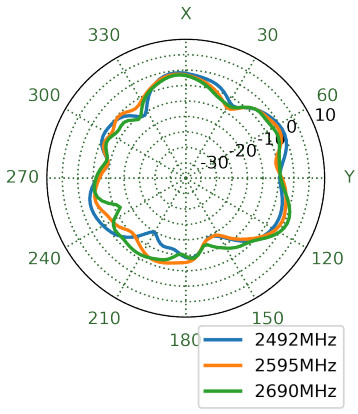


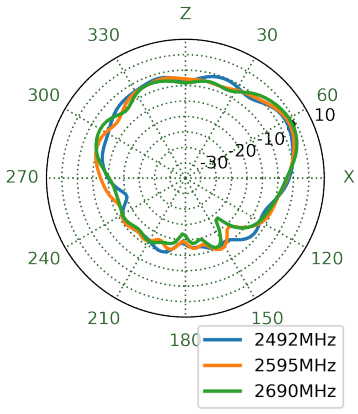
XY Plane	XZ Plane	YZ Plane
		

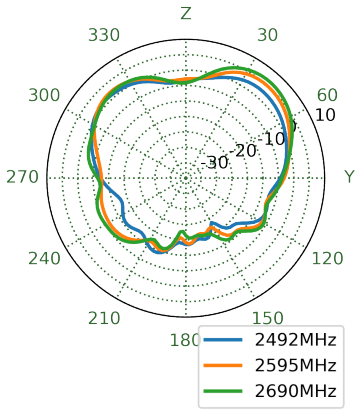
8.25 4G/5G-2 - Patterns at 2595 MHz



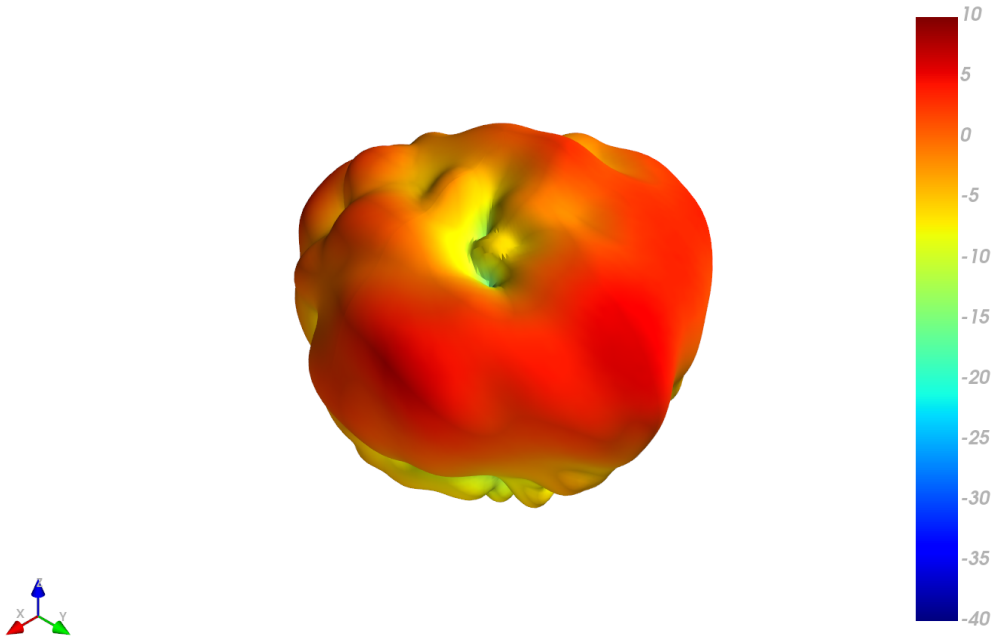
XY Plane	XZ Plane	YZ Plane



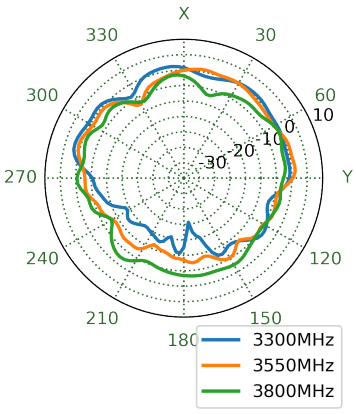


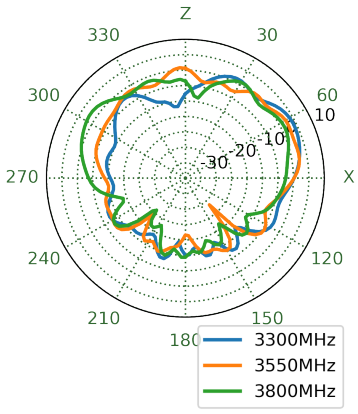


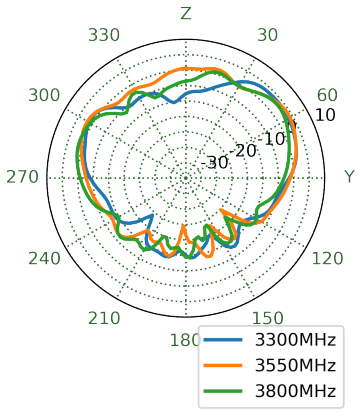
8.26 4G/5G-2 - Patterns at 3550 MHz



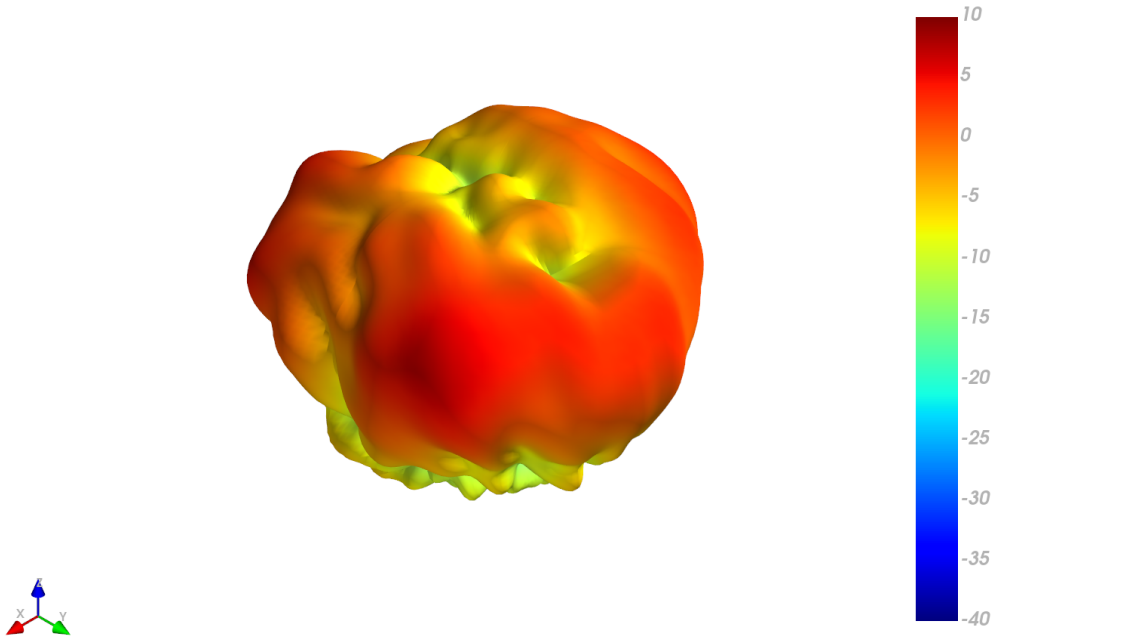
XY Plane	XZ Plane	YZ Plane



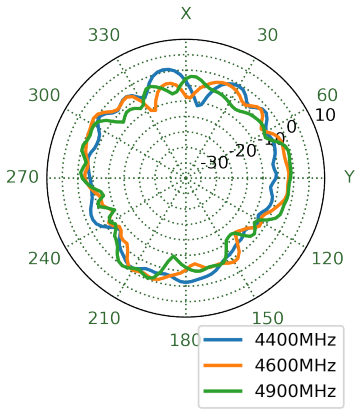


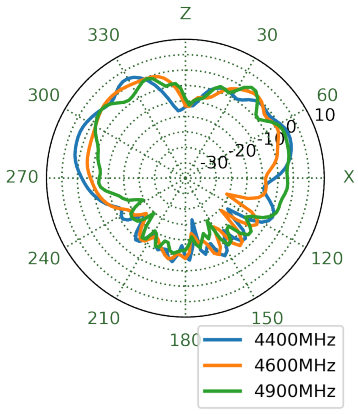


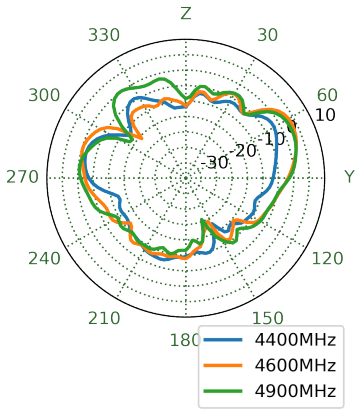
8.27 4G/5G-2 - Patterns at 4600 MHz



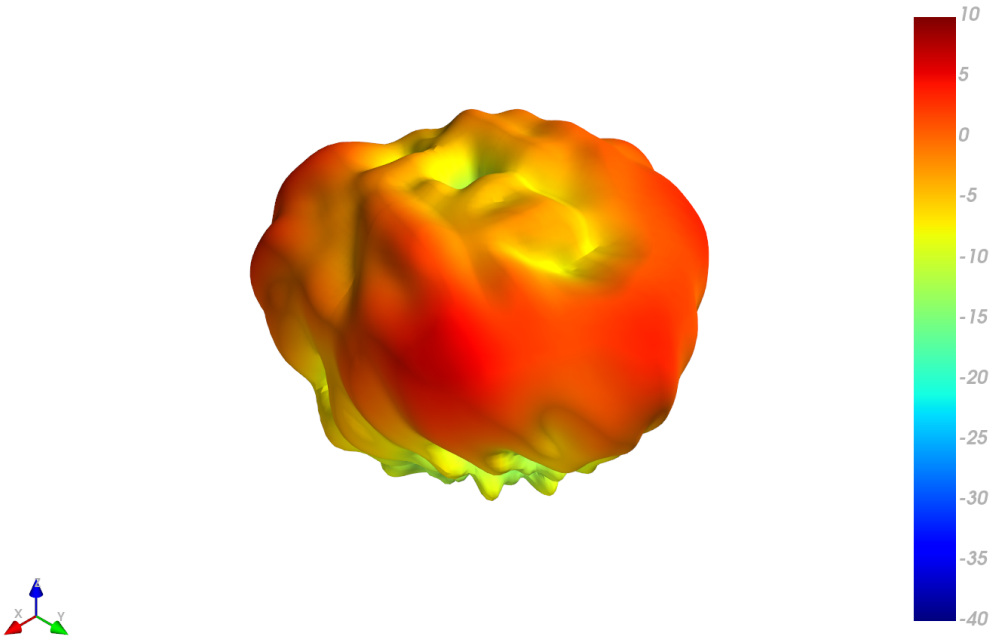
XY Plane	XZ Plane	YZ Plane



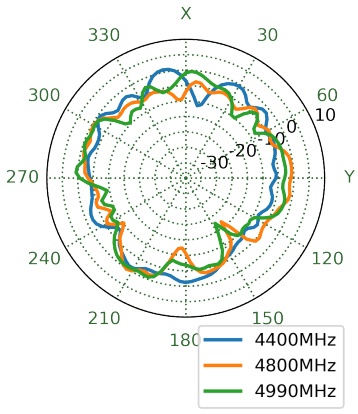


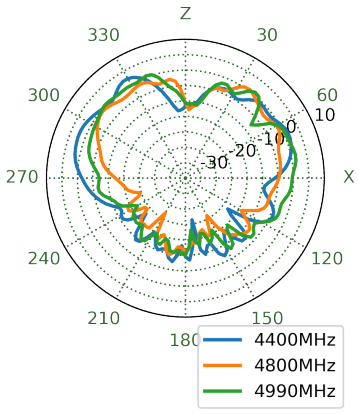


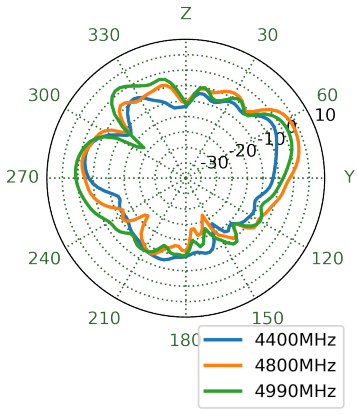
8.28 4G/5G-2 - Patterns at 4800 MHz



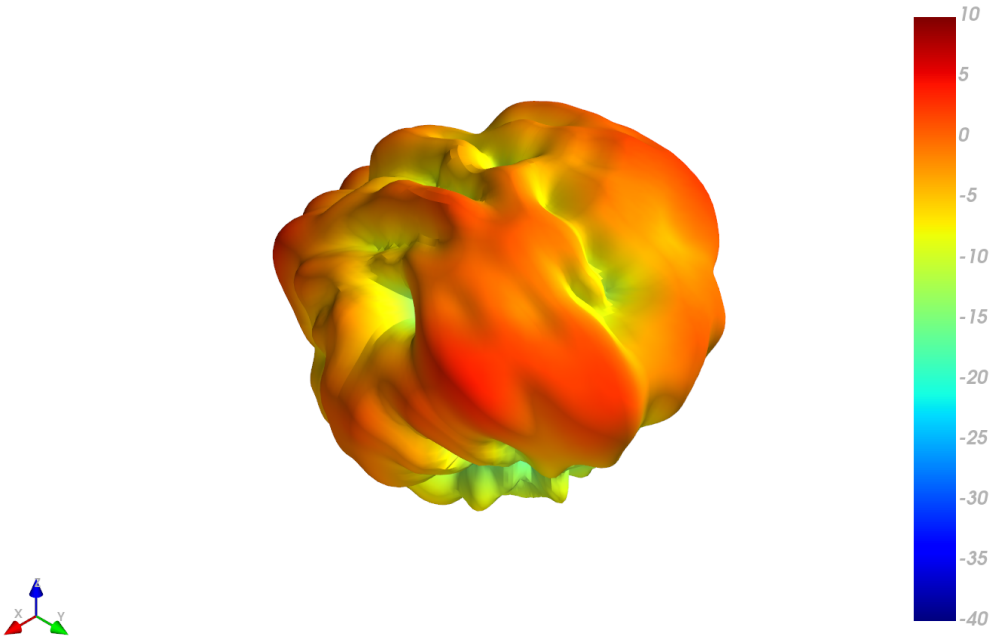
XY Plane	XZ Plane	YZ Plane

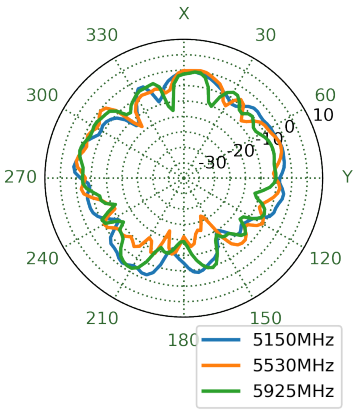
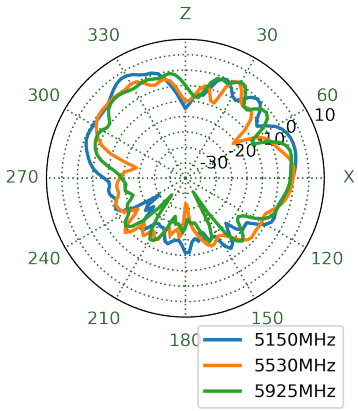
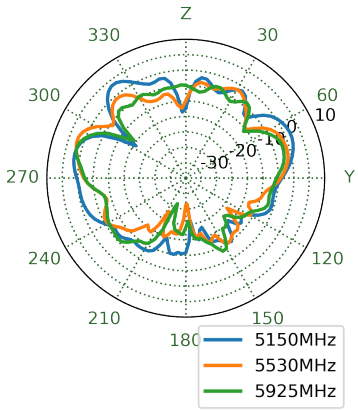




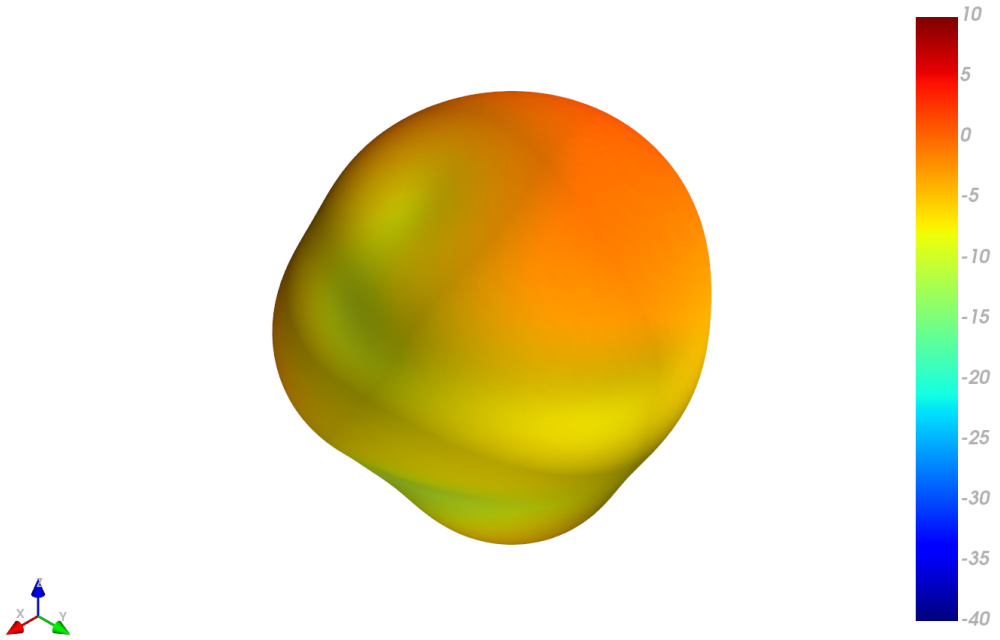


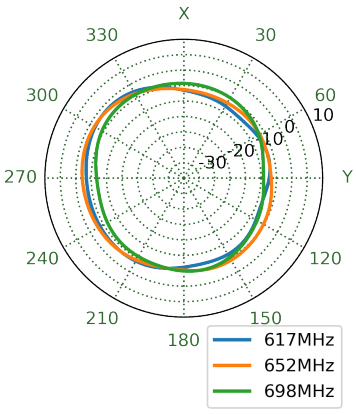
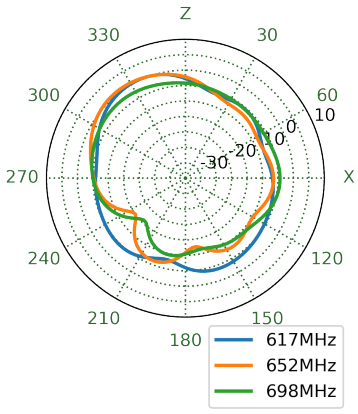
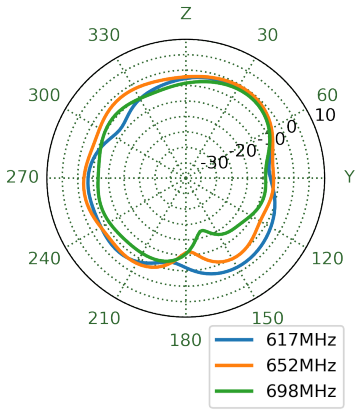
8.29 4G/5G-2 - Patterns at 5530 MHz



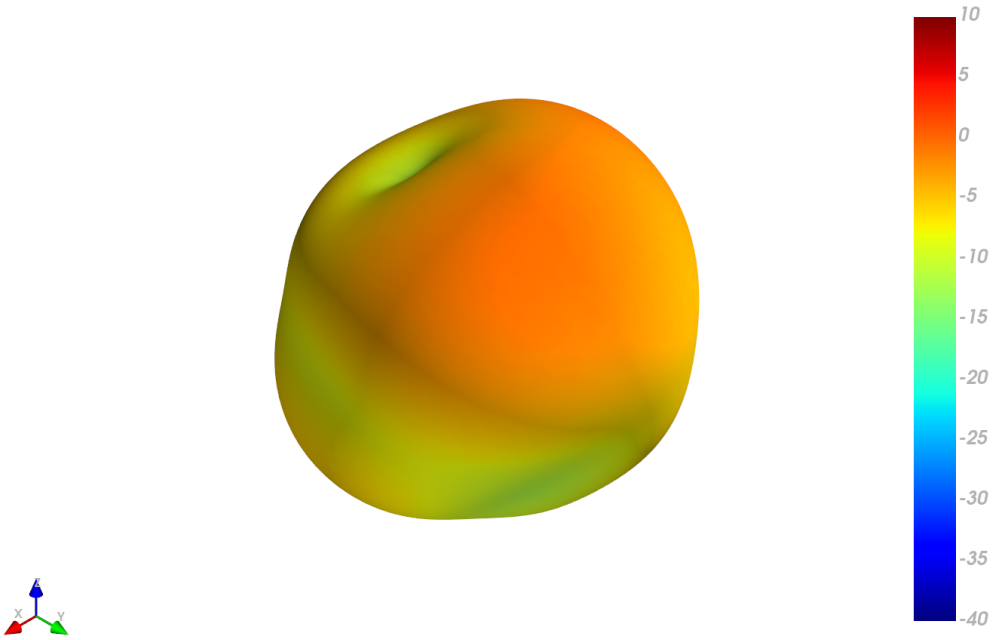
XY Plane	XZ Plane	YZ Plane
		

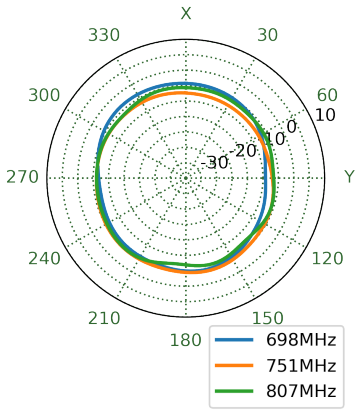
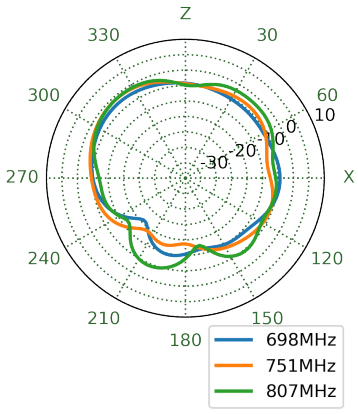
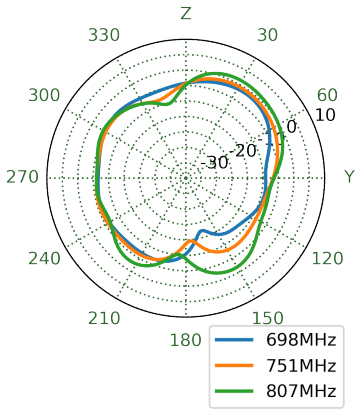
8.30 4G/5G-3 - Patterns at 652 MHz



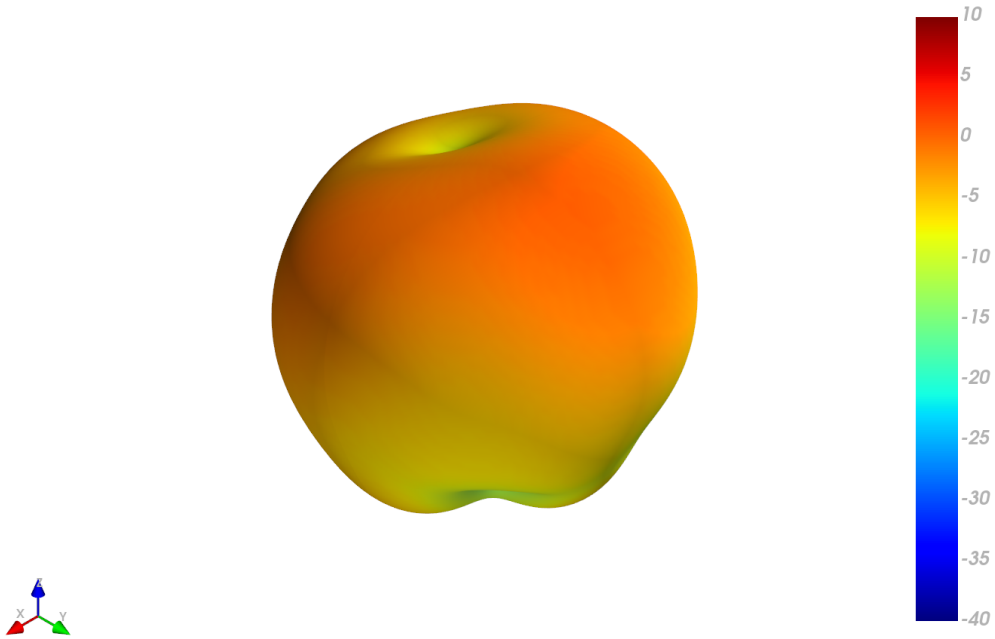
XY Plane	XZ Plane	YZ Plane
		

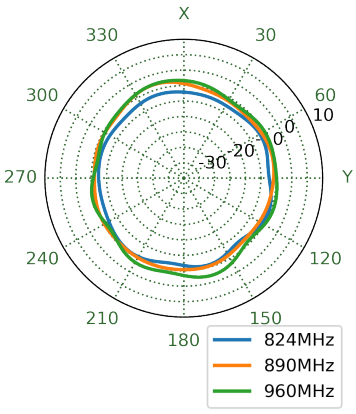
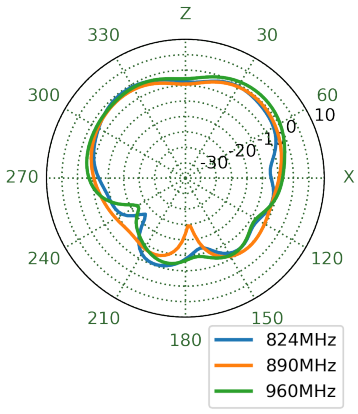
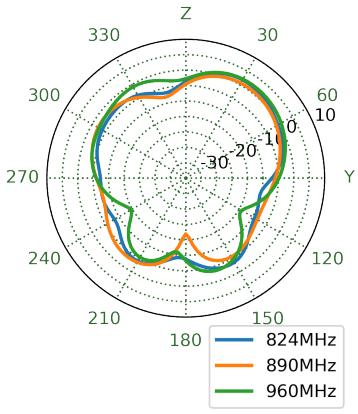
8.31 4G/5G-3 - Patterns at 751 MHz



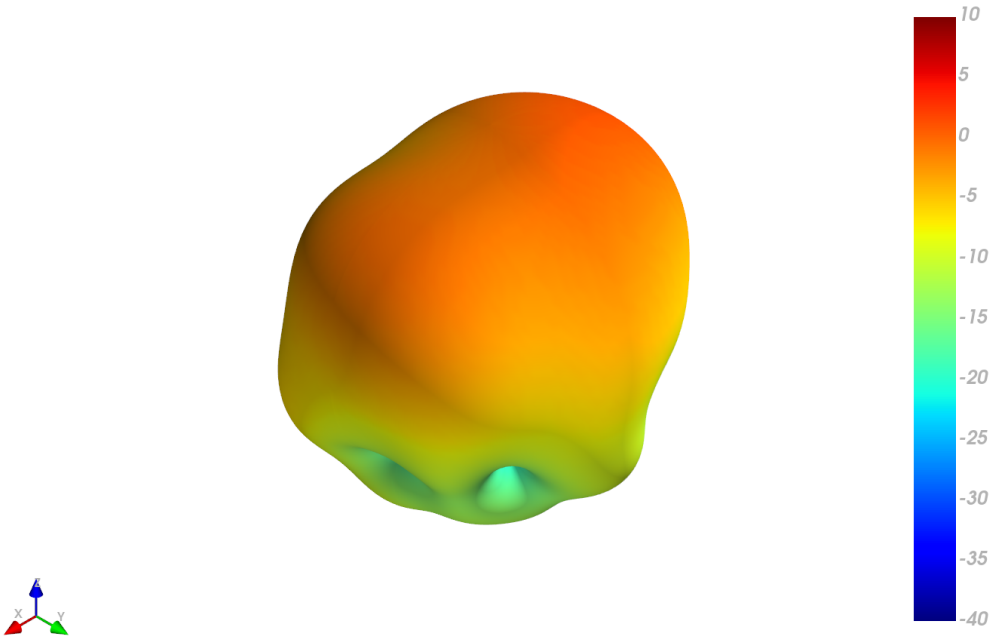
XY Plane	XZ Plane	YZ Plane
		

8.32 4G/5G-3 - Patterns at 890 MHz

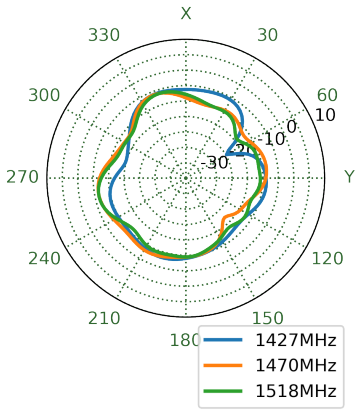


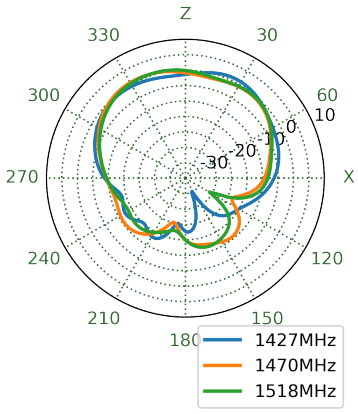
XY Plane	XZ Plane	YZ Plane
		

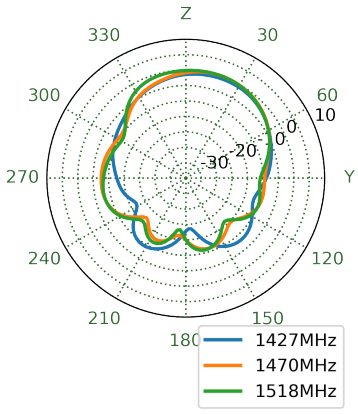
8.33 4G/5G-3 - Patterns at 1470 MHz



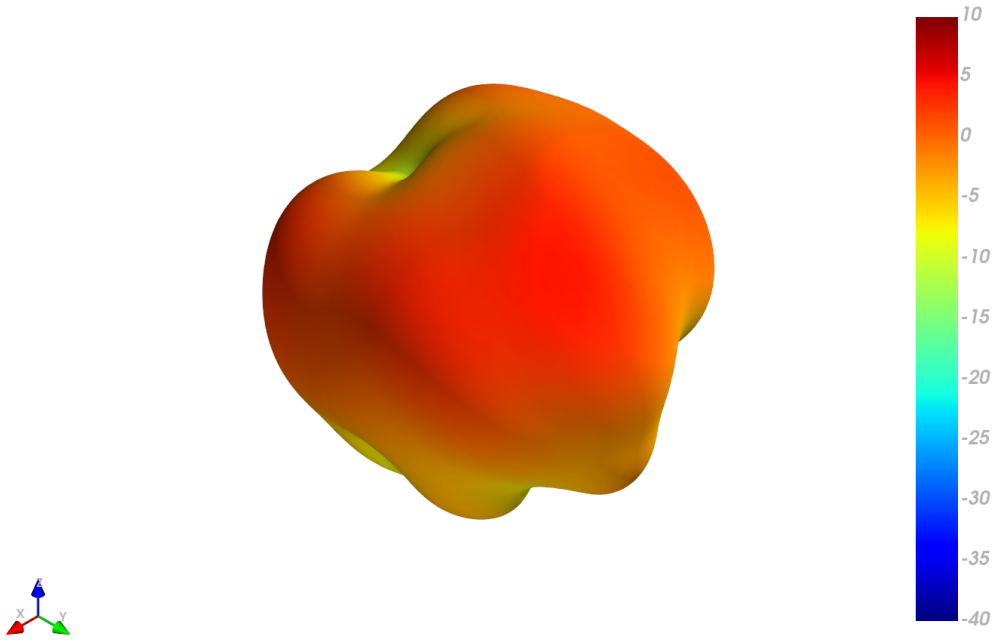
XY Plane	XZ Plane	YZ Plane



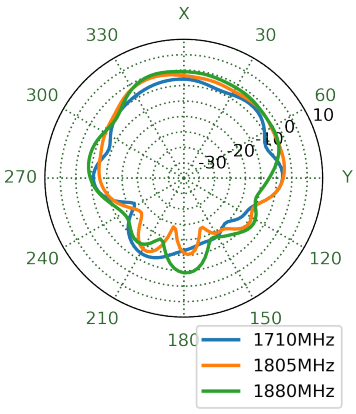


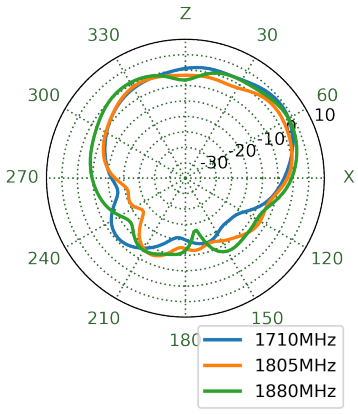


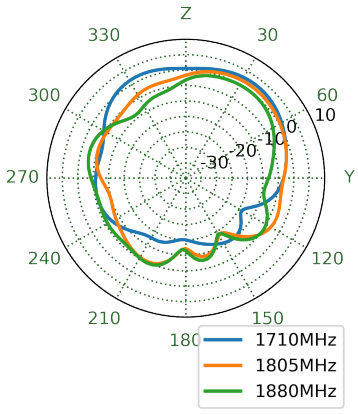
8.34 4G/5G-3 - Patterns at 1805 MHz



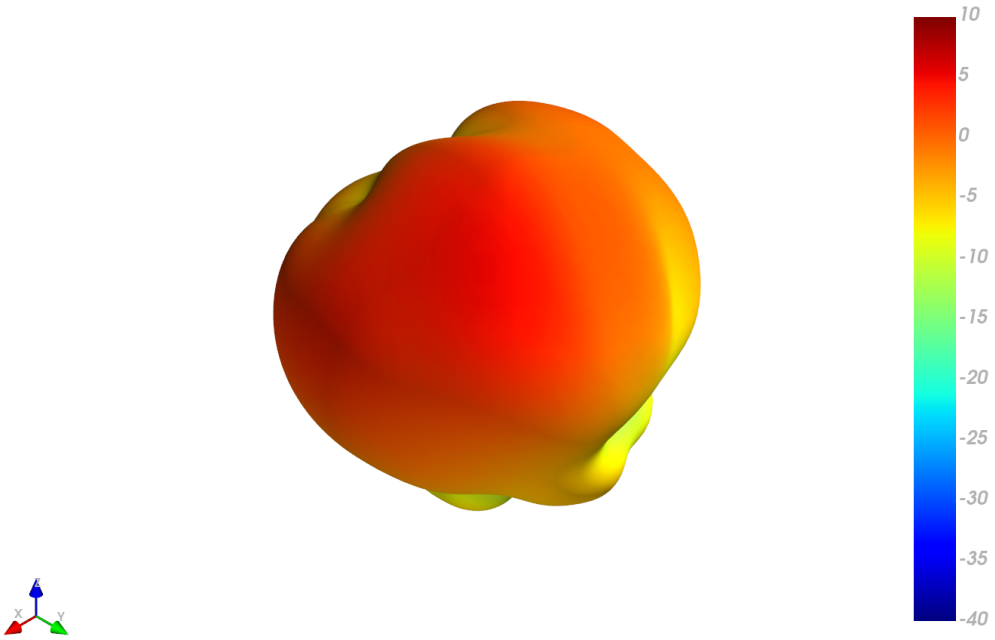
XY Plane	XZ Plane	YZ Plane



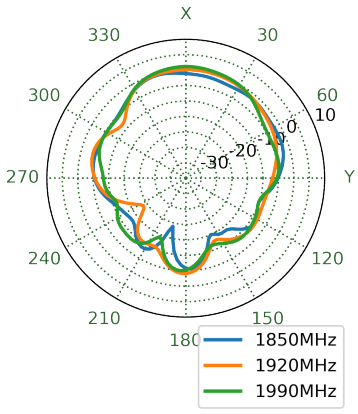


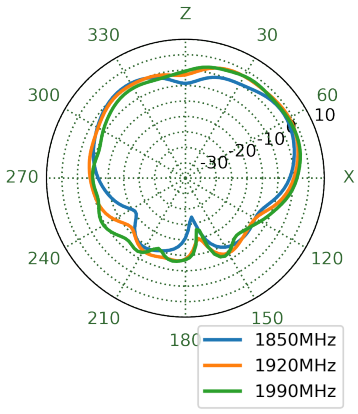


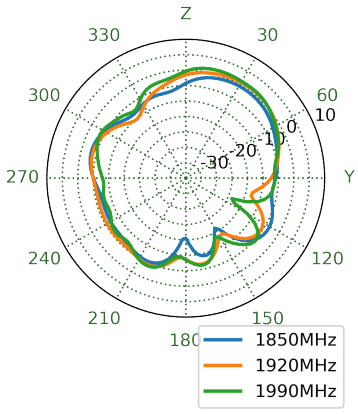
8.35 4G/5G-3 - Patterns at 1920 MHz



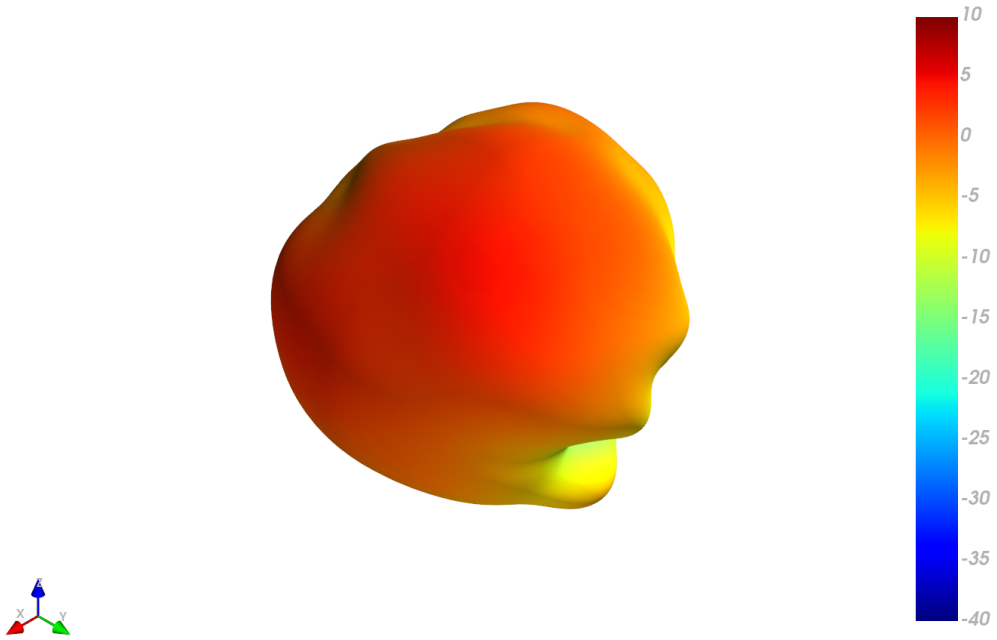
XY Plane	XZ Plane	YZ Plane

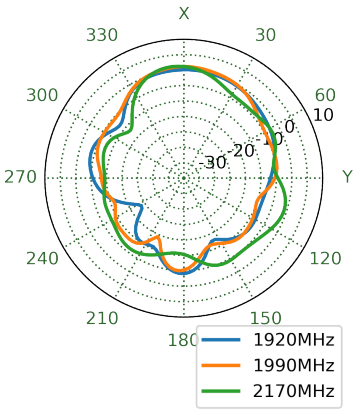
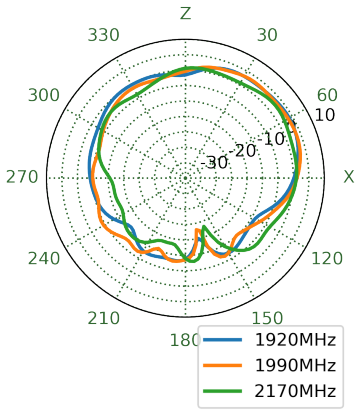
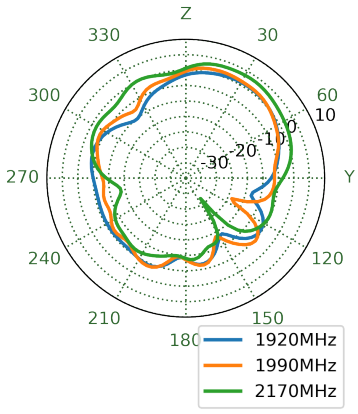




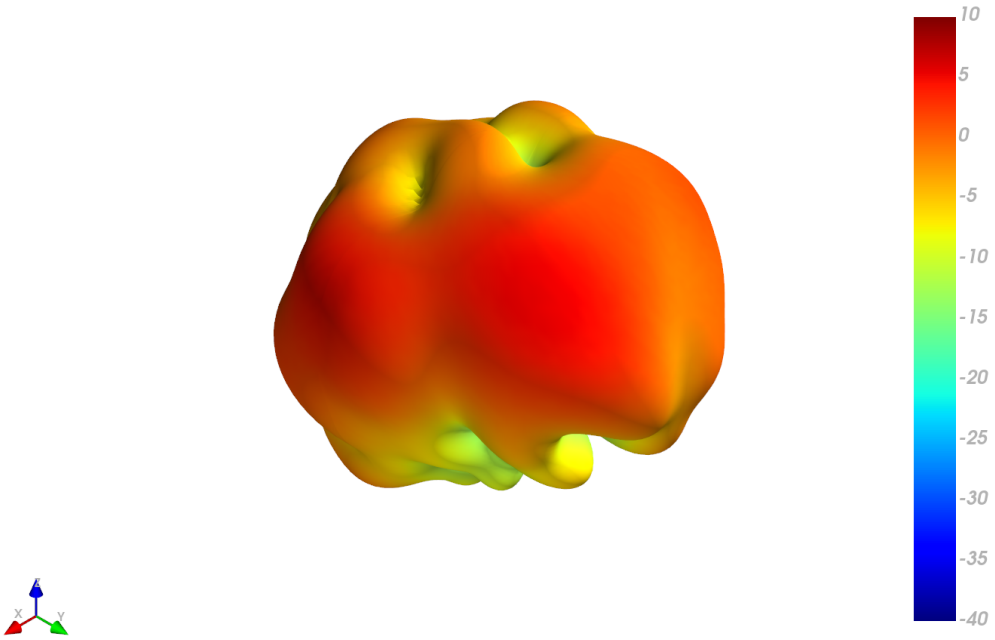


8.36 4G/5G-3 - Patterns at 1990 MHz

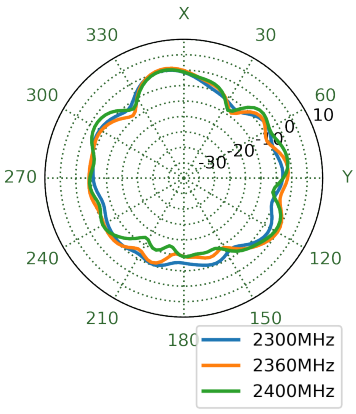


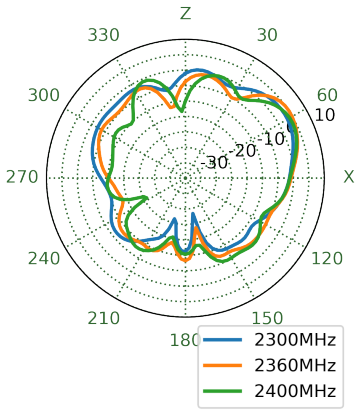
XY Plane	XZ Plane	YZ Plane
		

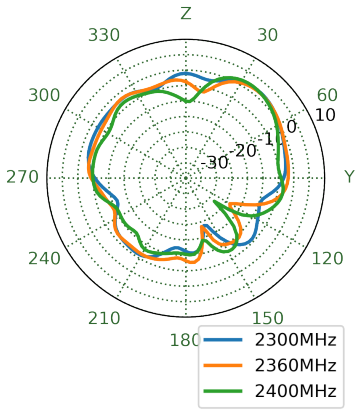
8.37 4G/5G-3 - Patterns at 2360 MHz



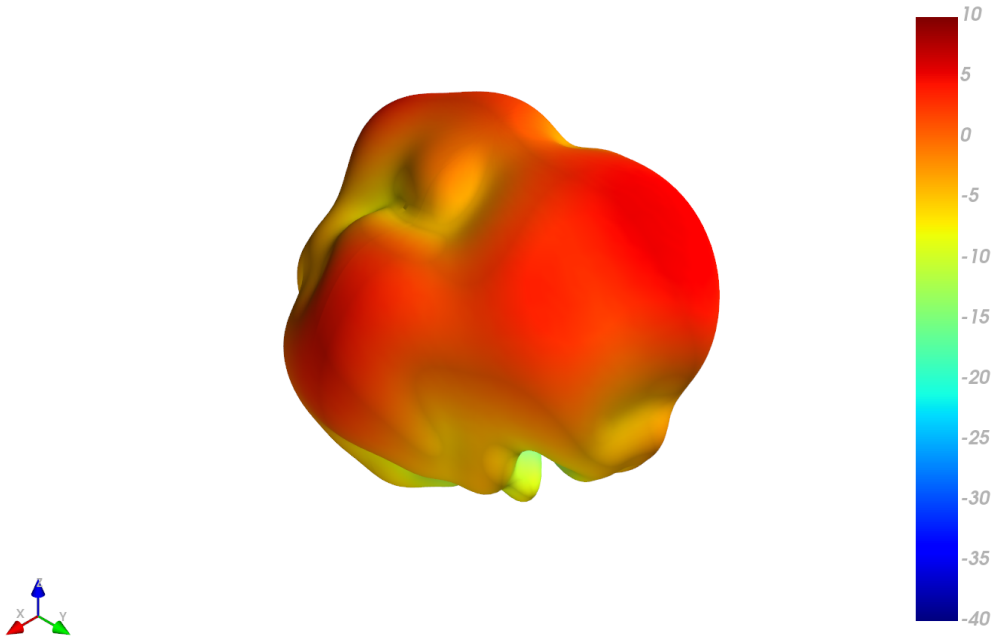
XY Plane	XZ Plane	YZ Plane



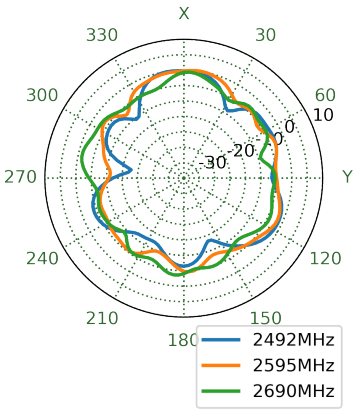


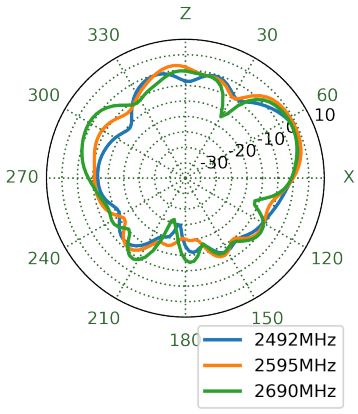


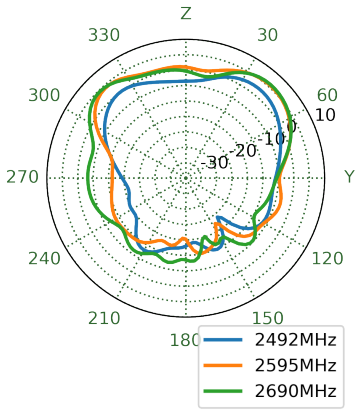
8.38 4G/5G-3 - Patterns at 2595 MHz



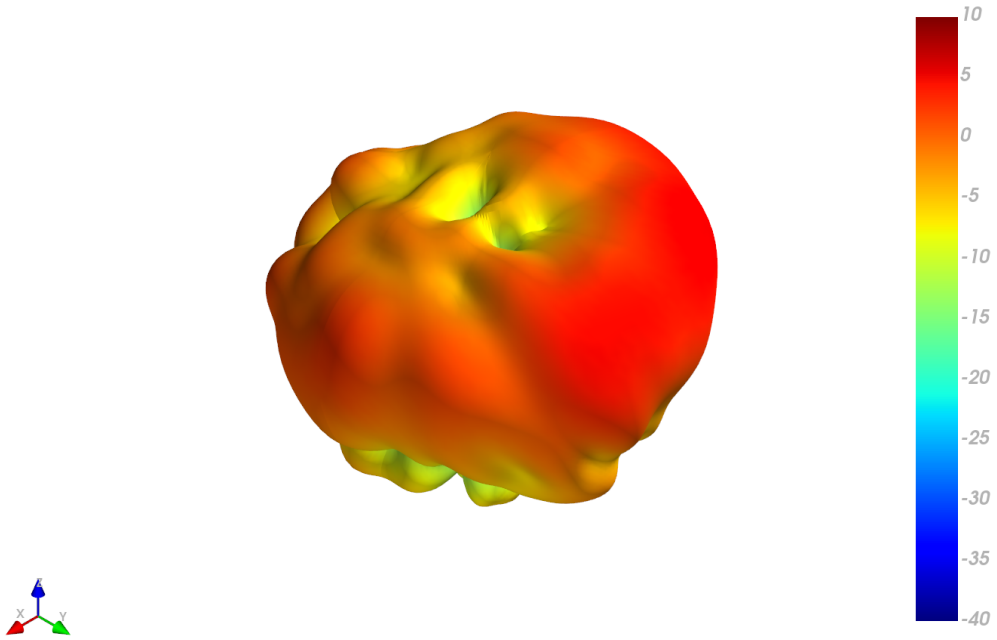
XY Plane	XZ Plane	YZ Plane



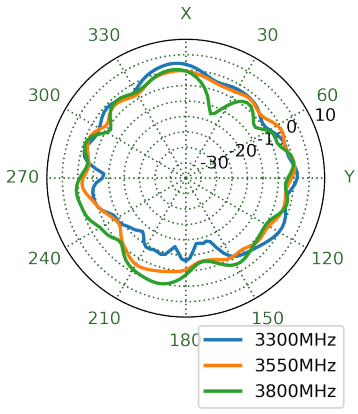


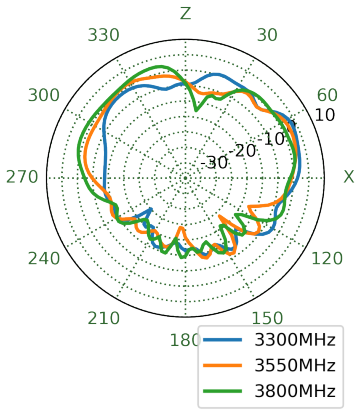


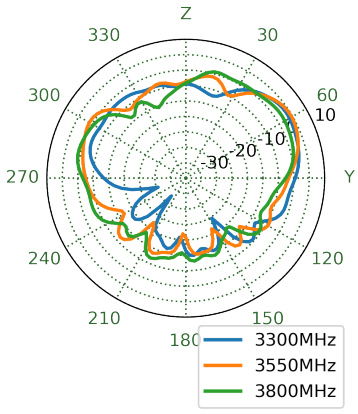
8.39 4G/5G-3 - Patterns at 3550 MHz



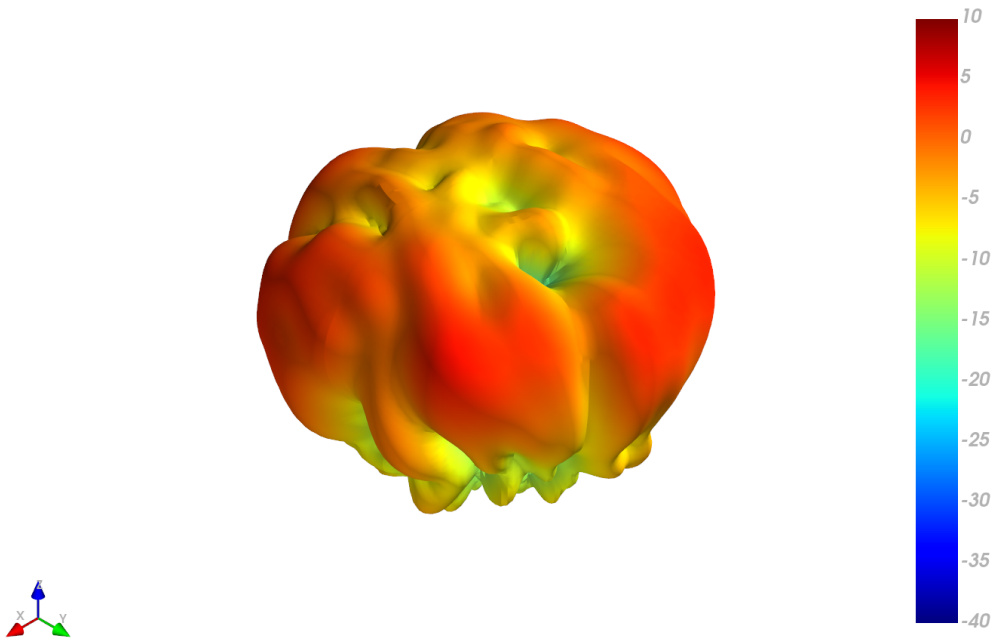
XY Plane	XZ Plane	YZ Plane



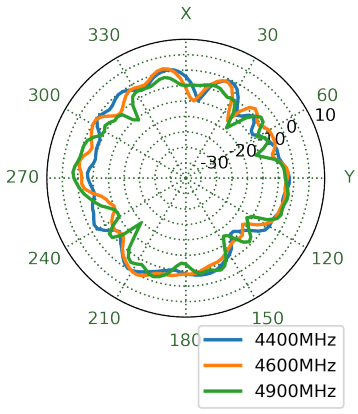


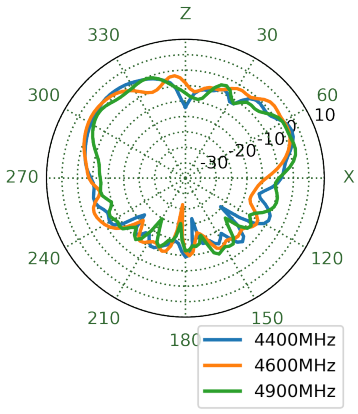


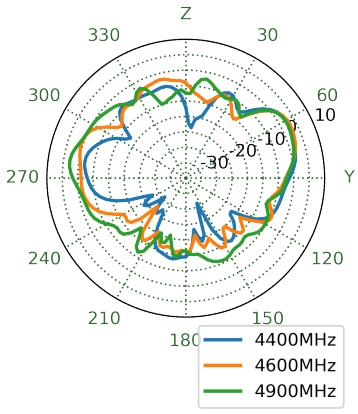
8.40 4G/5G-3 - Patterns at 4600 MHz



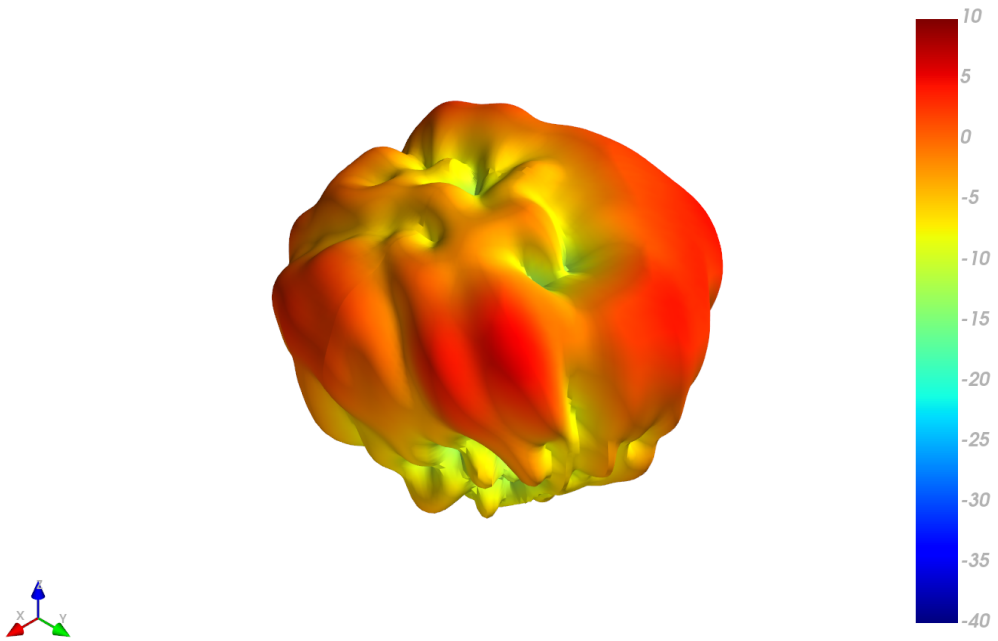
XY Plane	XZ Plane	YZ Plane



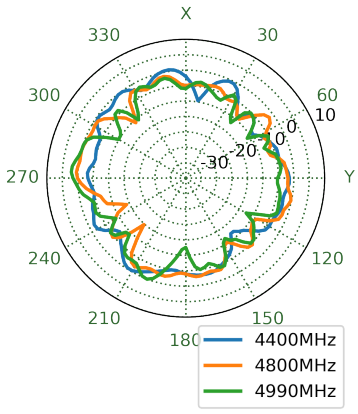


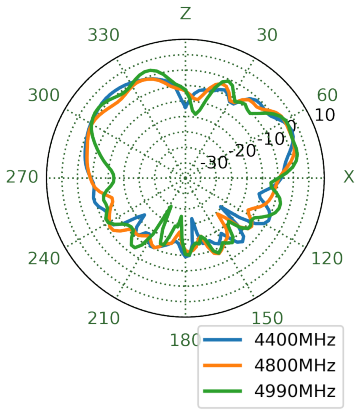


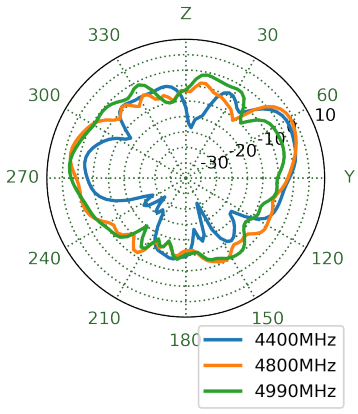
8.41 4G/5G-3 - Patterns at 4800 MHz



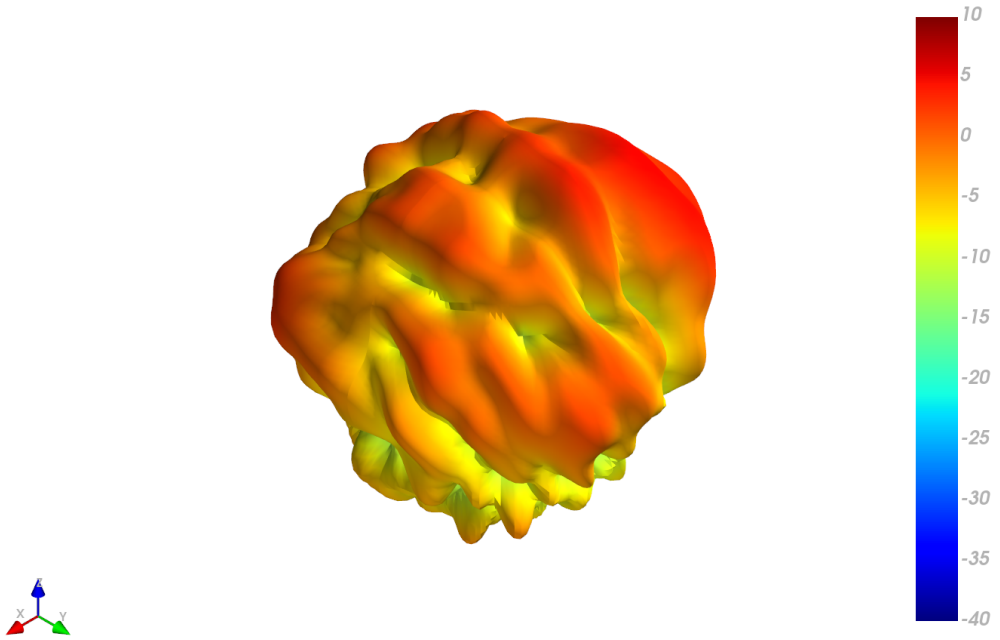
XY Plane	XZ Plane	YZ Plane



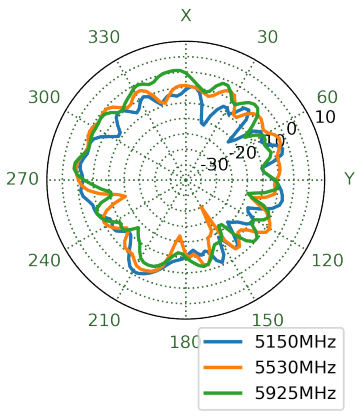


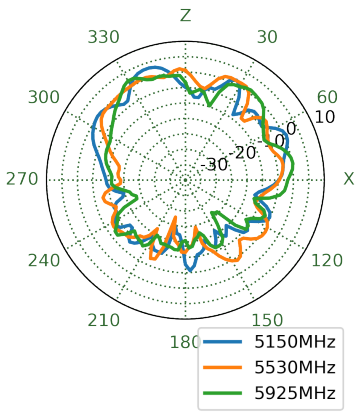


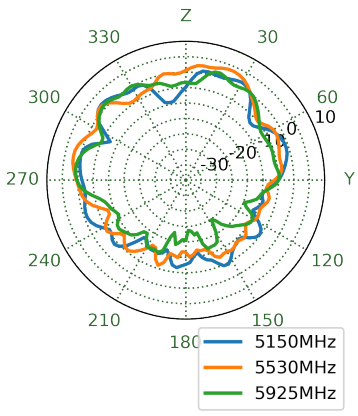
8.42 4G/5G-3 - Patterns at 5530 MHz



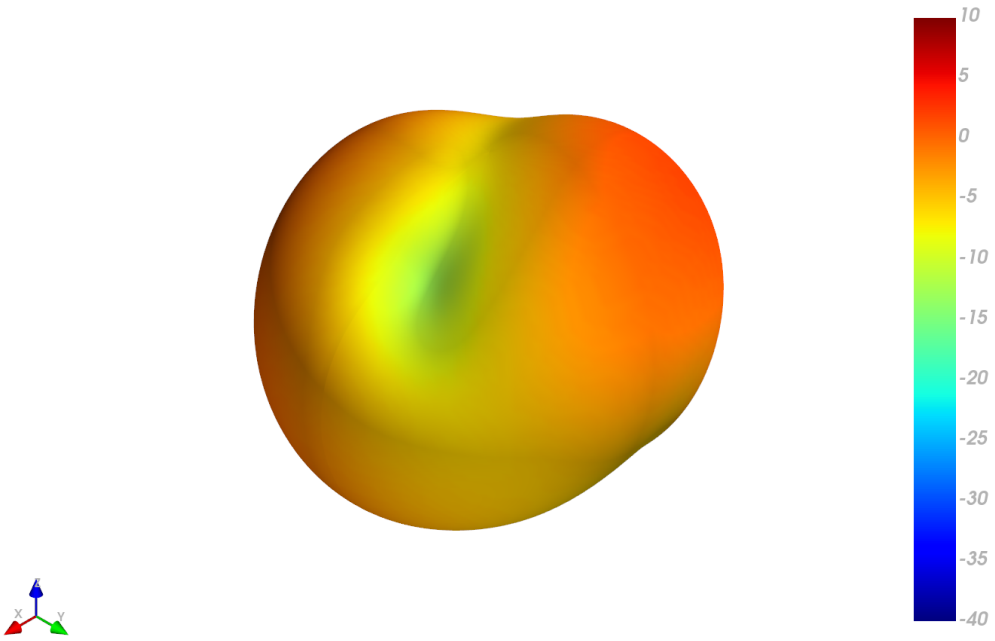
XY Plane	XZ Plane	YZ Plane



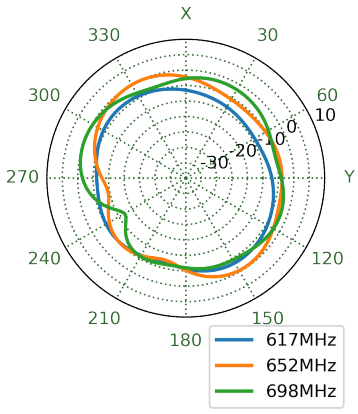


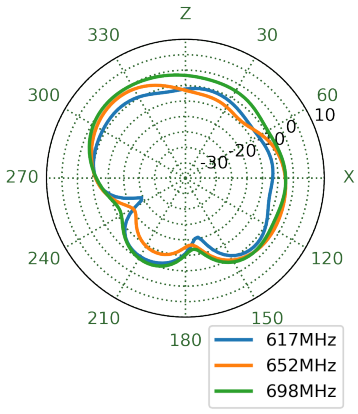


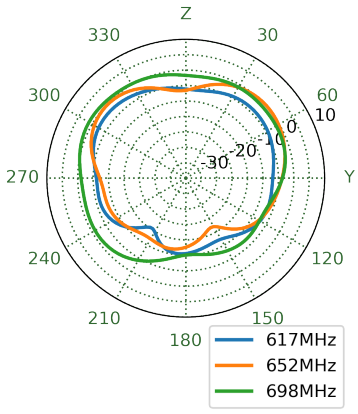
8.43 4G/5G-4 - Patterns at 652 MHz



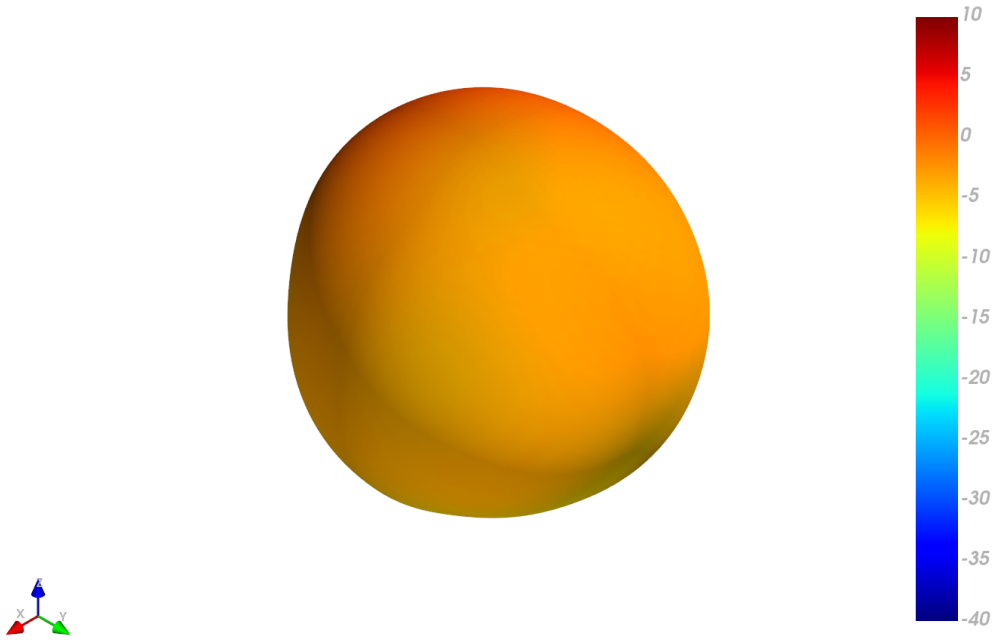
XY Plane	XZ Plane	YZ Plane



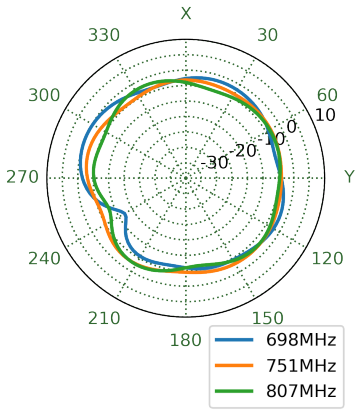


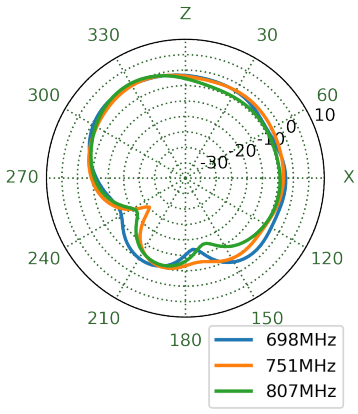


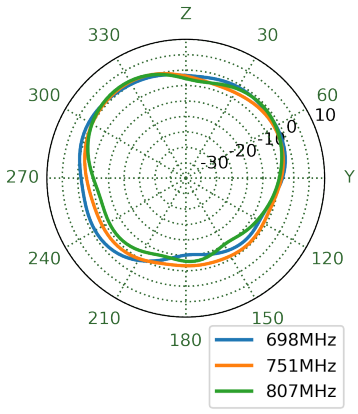
8.44 4G/5G-4 - Patterns at 751 MHz



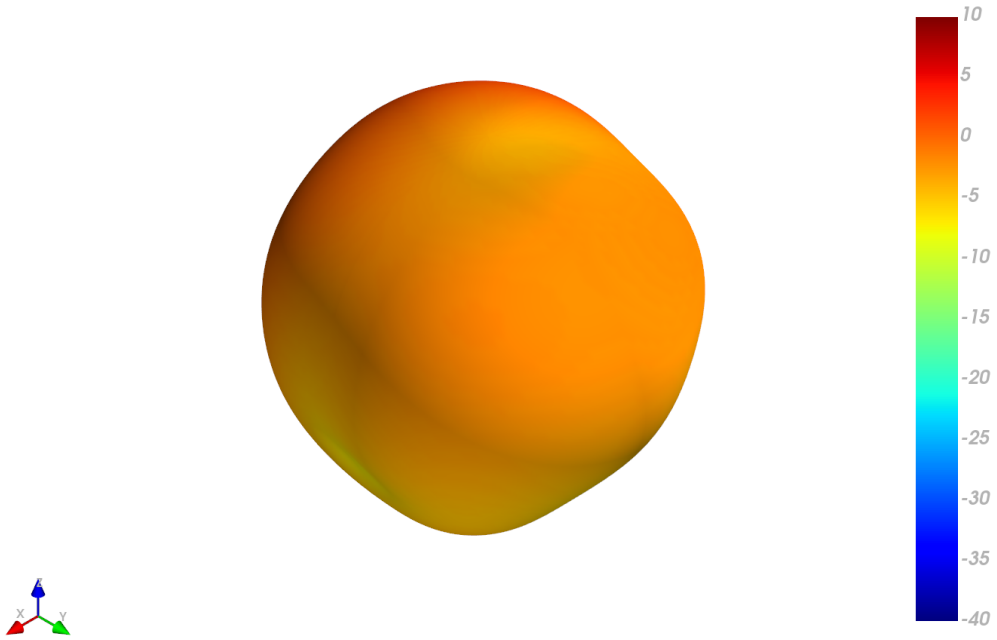
XY Plane	XZ Plane	YZ Plane



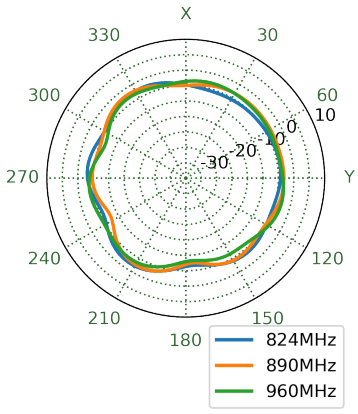


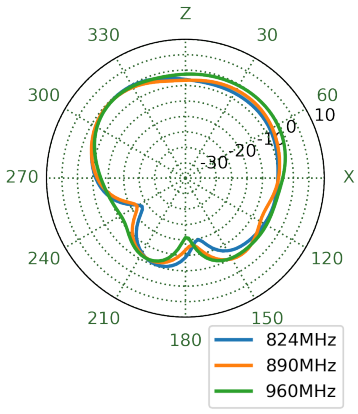


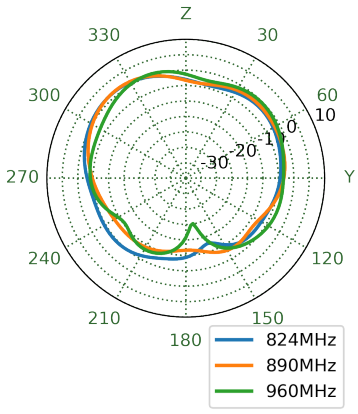
8.45 4G/5G-4 - Patterns at 890 MHz



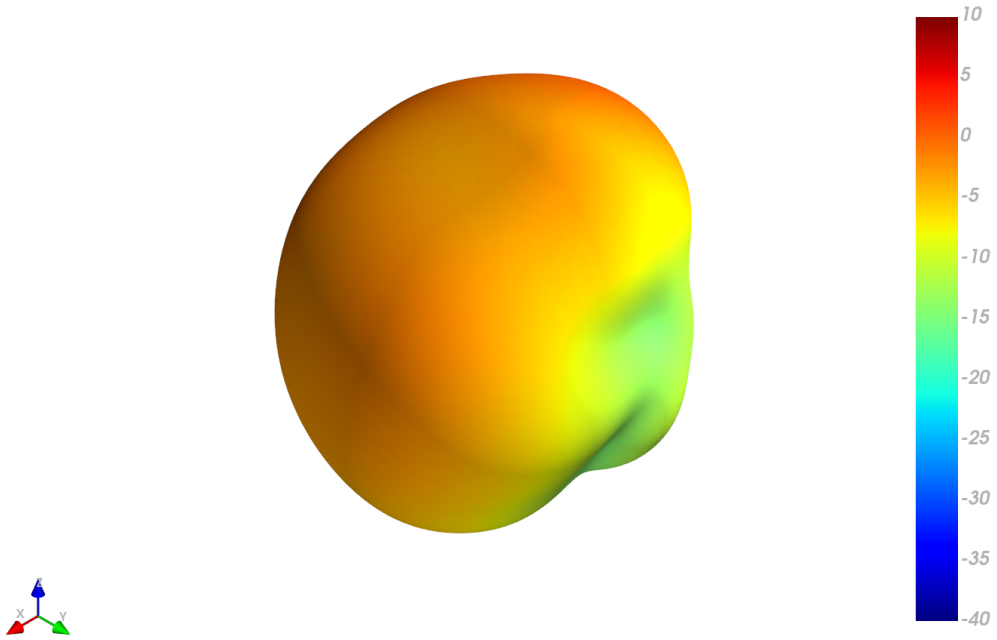
XY Plane	XZ Plane	YZ Plane



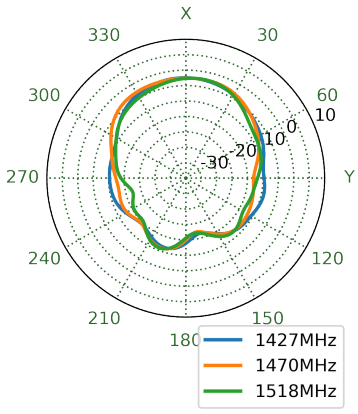


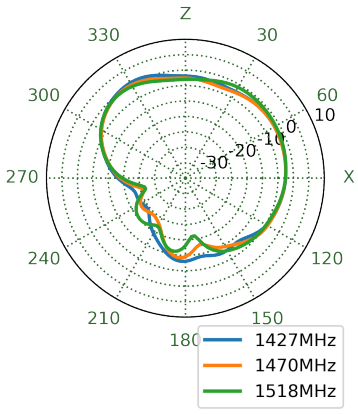


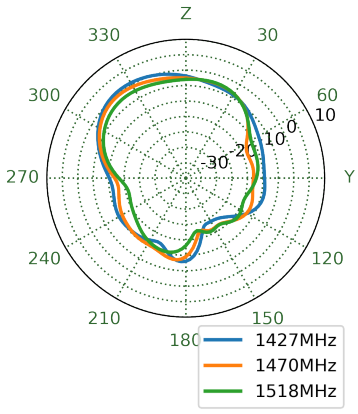
8.46 4G/5G-4 - Patterns at 1470 MHz



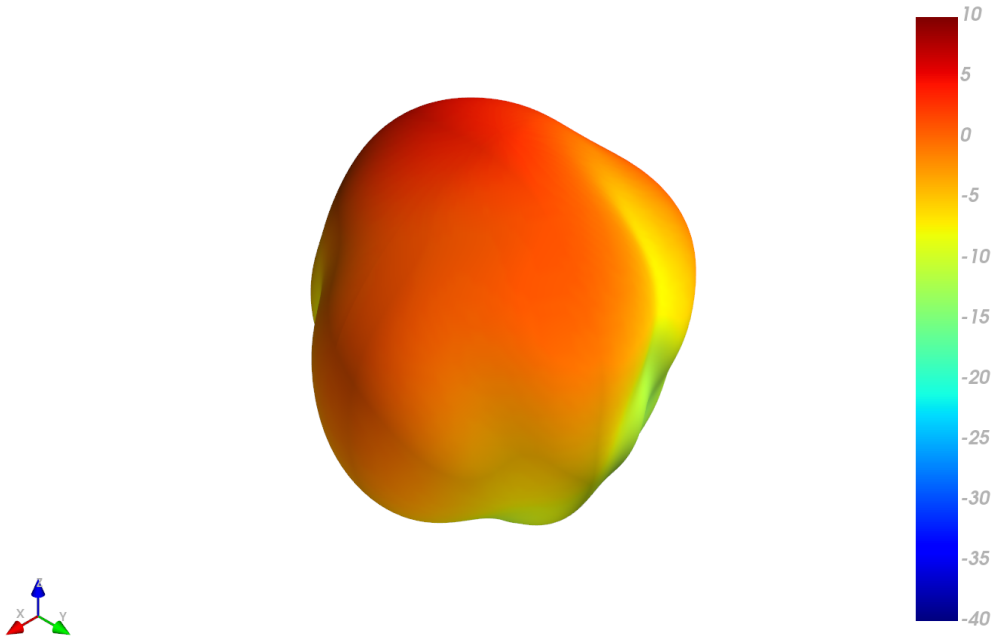
XY Plane	XZ Plane	YZ Plane



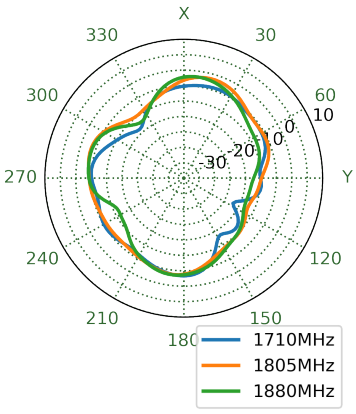


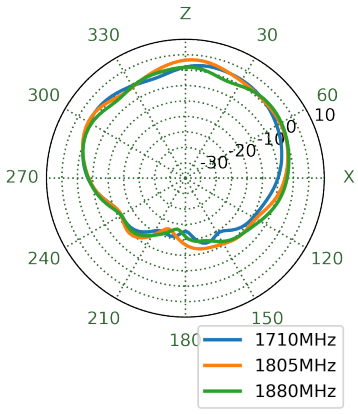


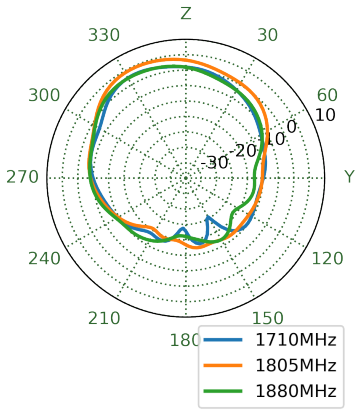
8.47 4G/5G-4 - Patterns at 1805 MHz



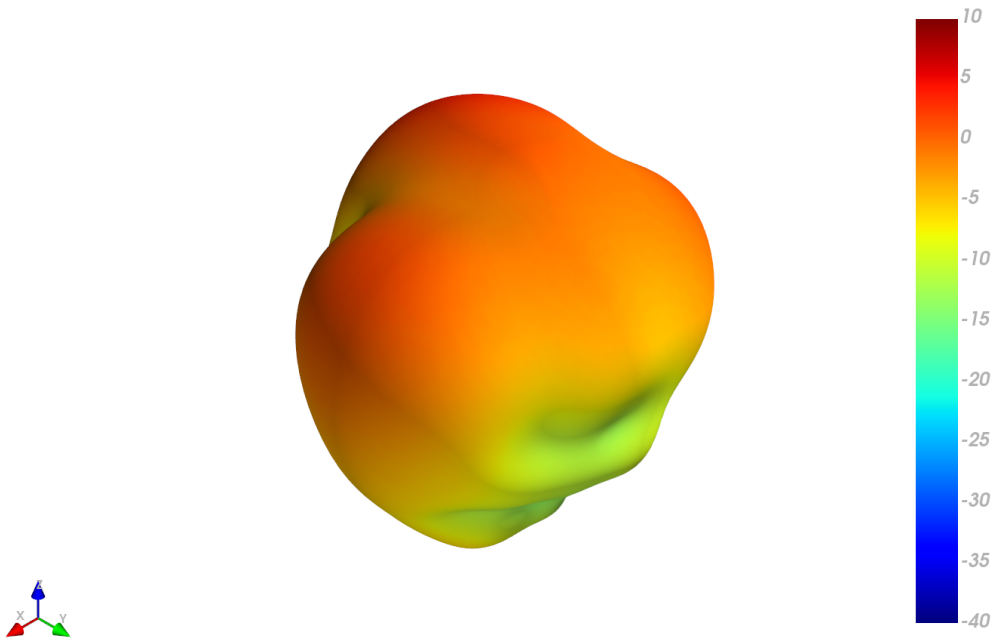
XY Plane	XZ Plane	YZ Plane



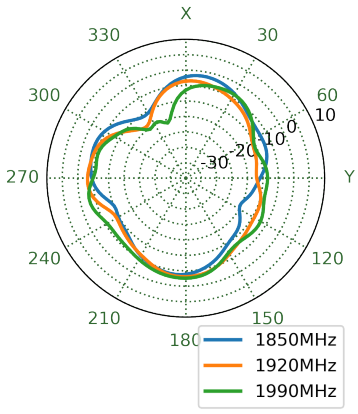


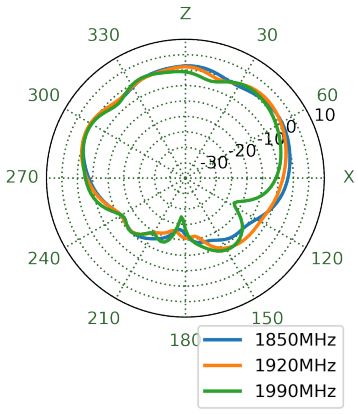


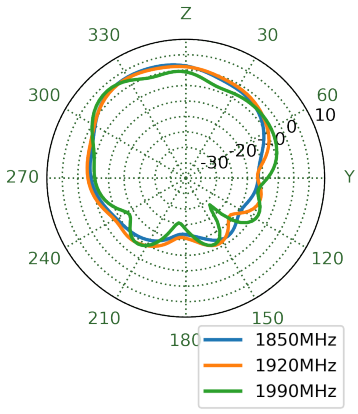
8.48 4G/5G-4 - Patterns at 1920 MHz



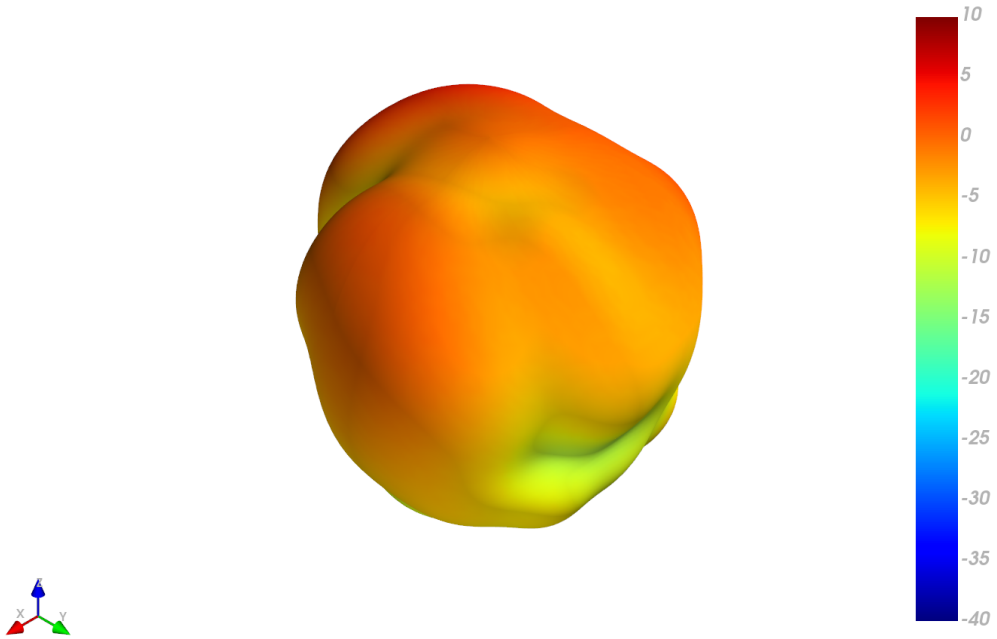
XY Plane	XZ Plane	YZ Plane



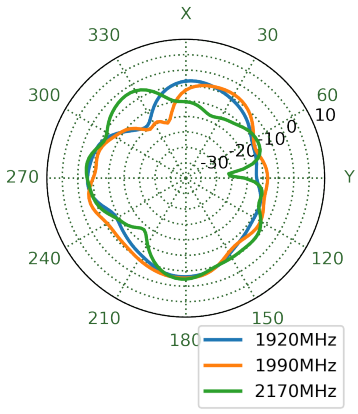


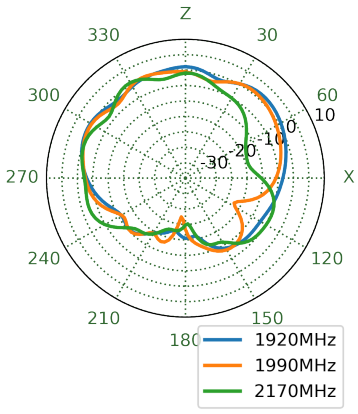


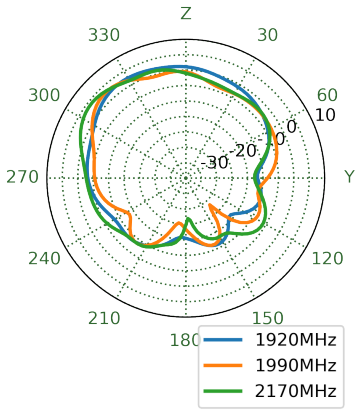
8.49 4G/5G-4 - Patterns at 1990 MHz



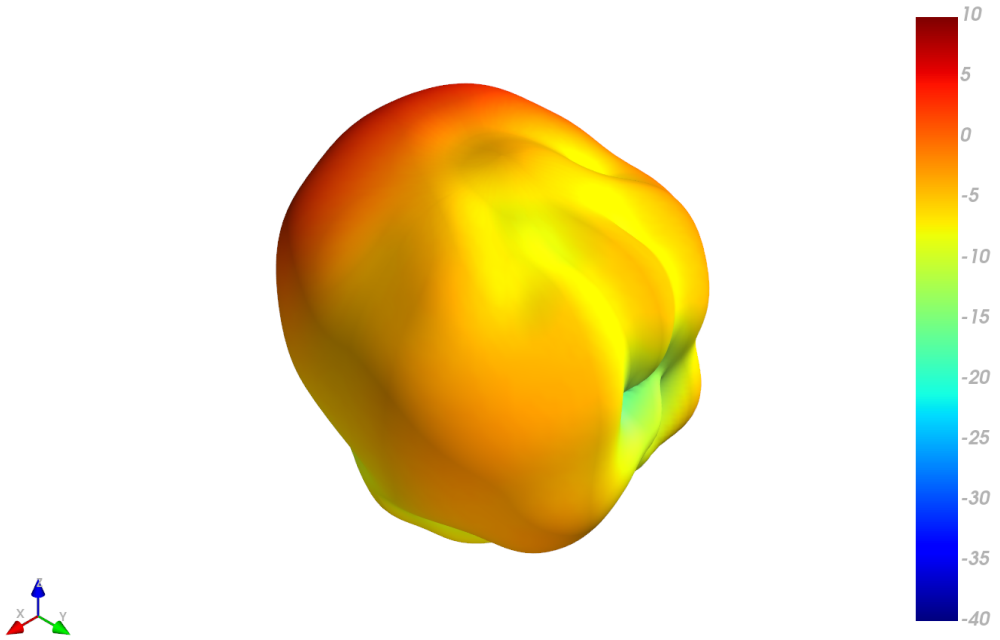
XY Plane	XZ Plane	YZ Plane



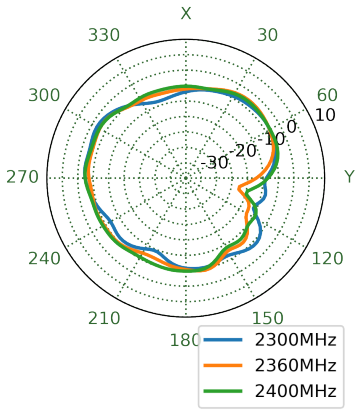


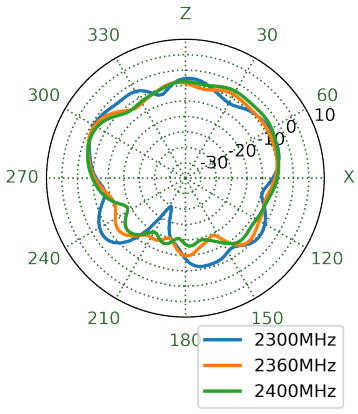


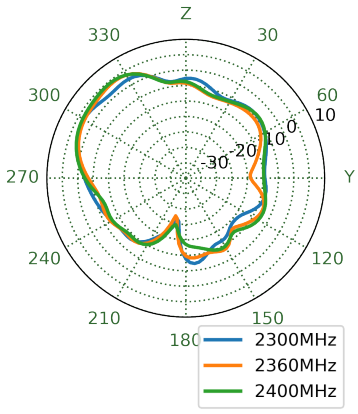
8.50 4G/5G-4 - Patterns at 2360 MHz



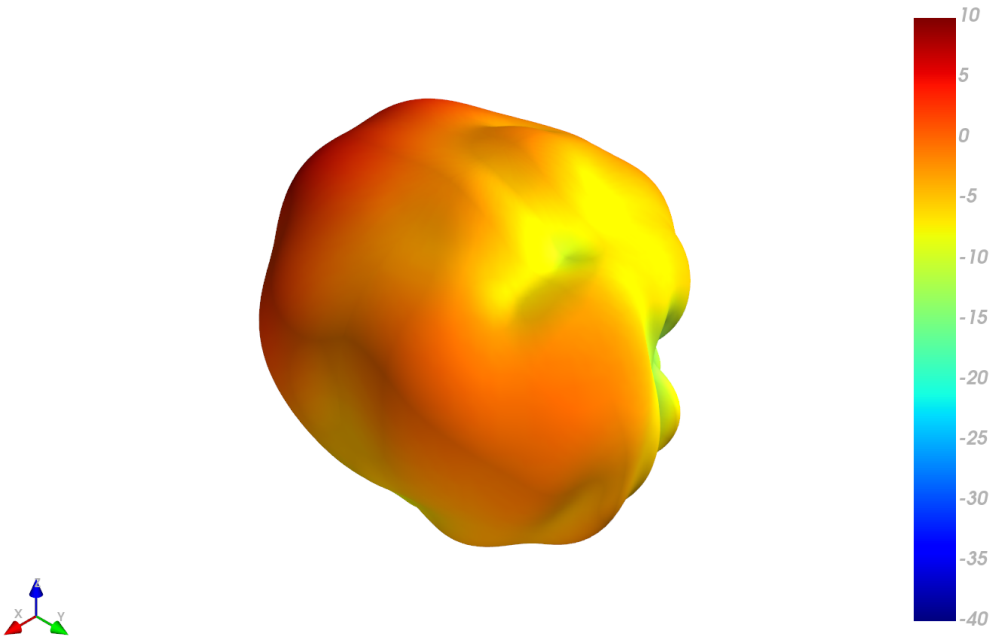
XY Plane	XZ Plane	YZ Plane



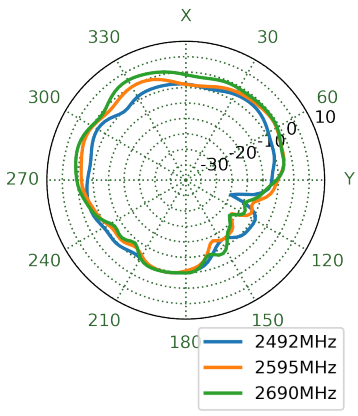


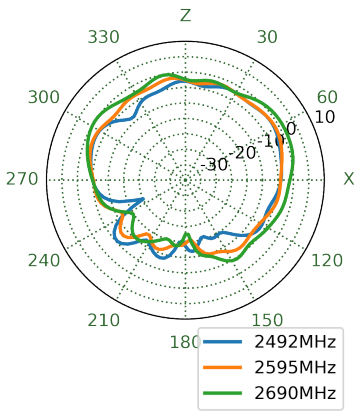


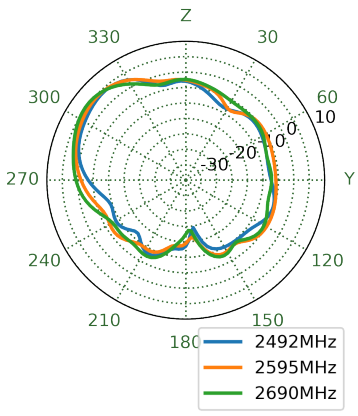
8.51 4G/5G-4 - Patterns at 2595 MHz



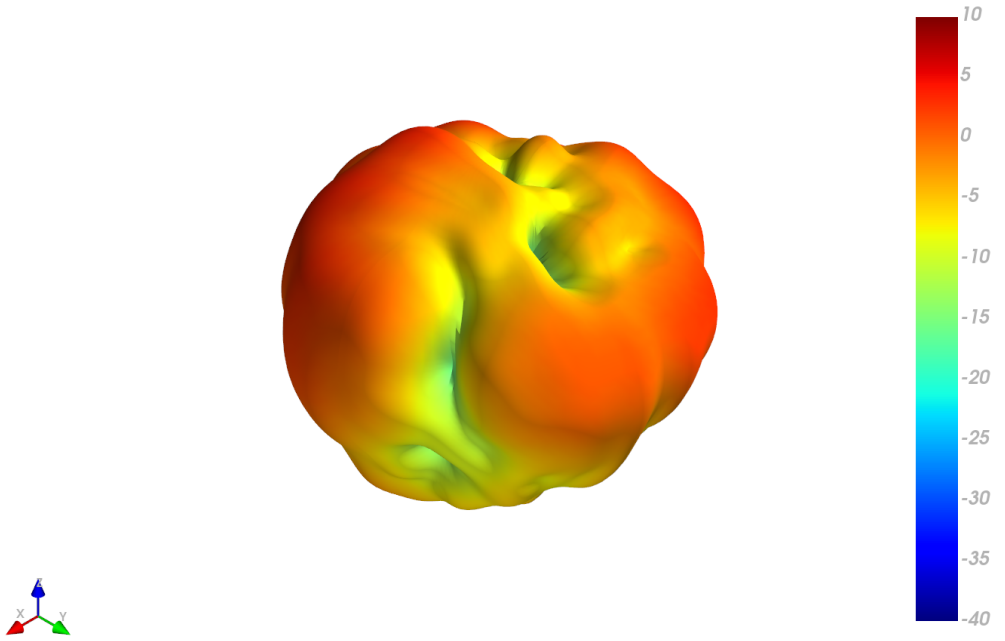
XY Plane	XZ Plane	YZ Plane

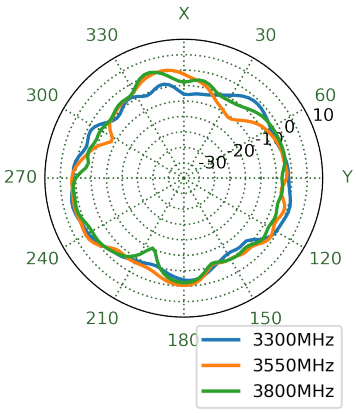
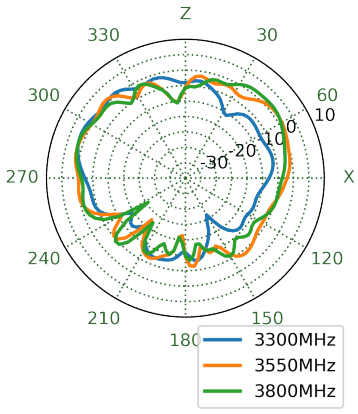
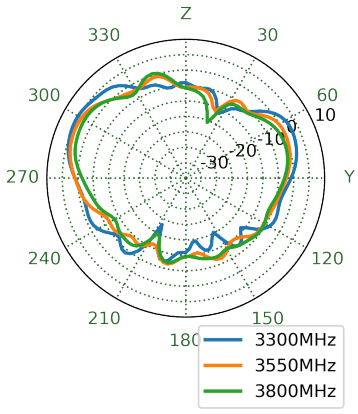




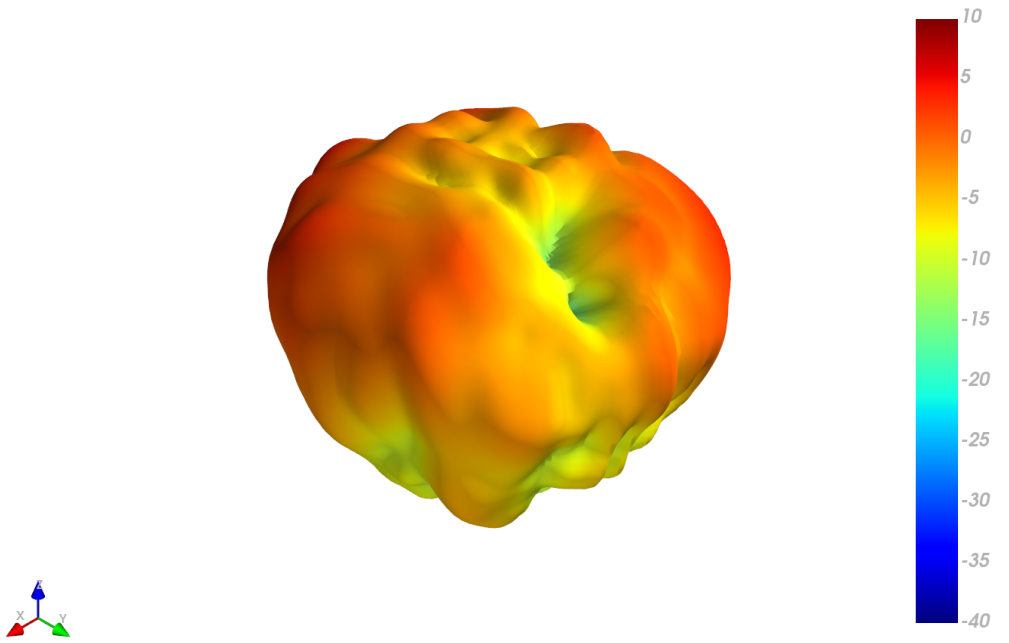


8.52 4G/5G-4 - Patterns at 3550 MHz

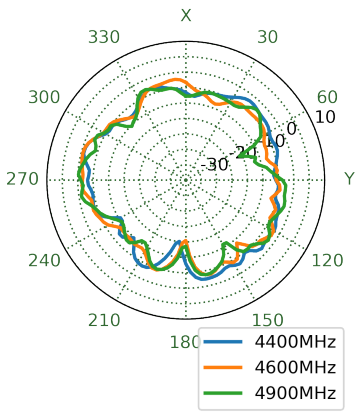


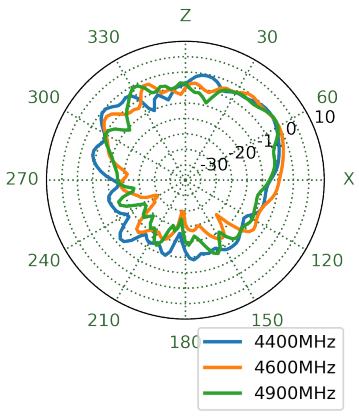
XY Plane	XZ Plane	YZ Plane
		

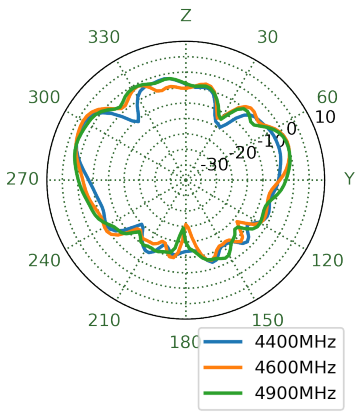
8.53 4G/5G-4 - Patterns at 4600 MHz



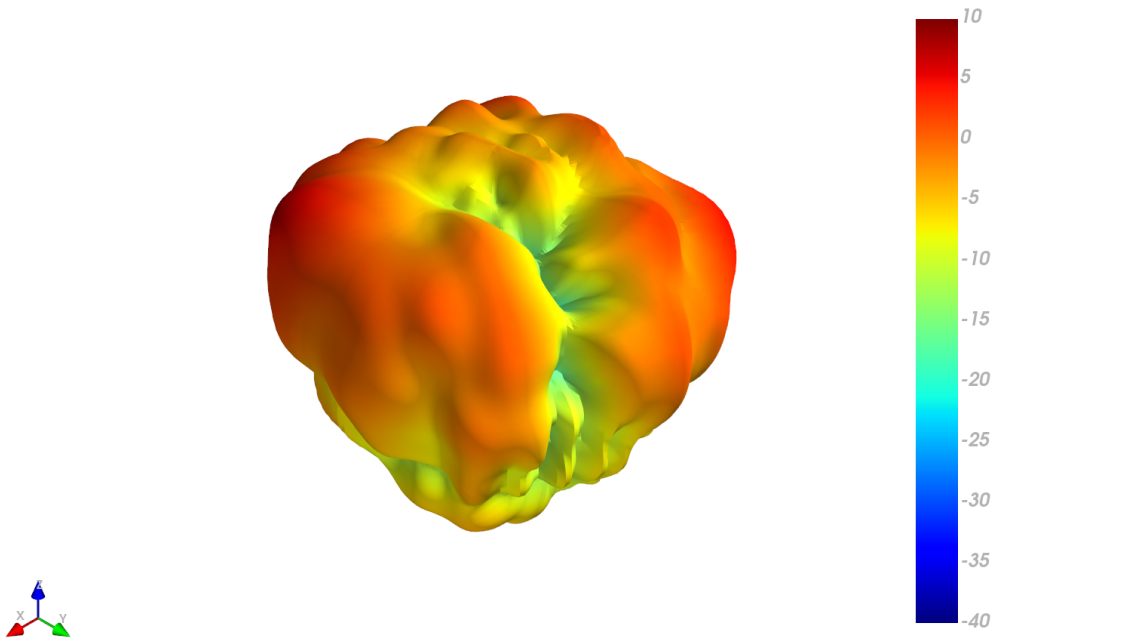
XY Plane	XZ Plane	YZ Plane



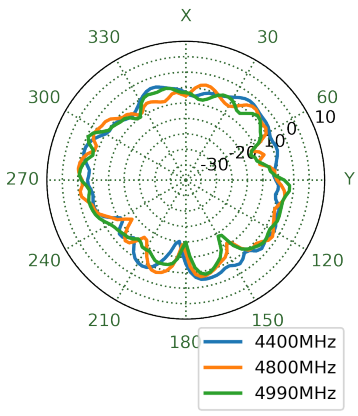


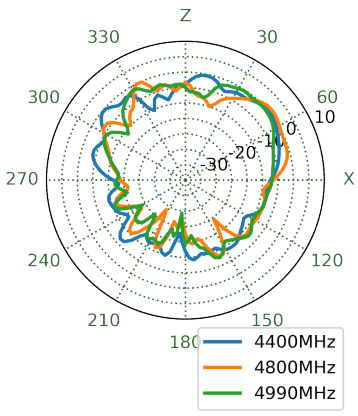


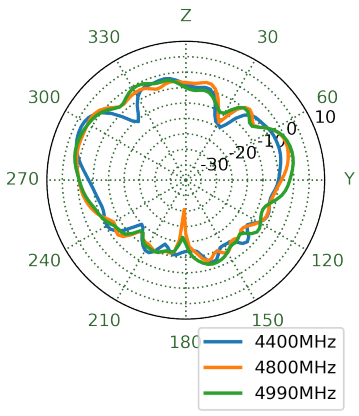
8.54 4G/5G-4 - Patterns at 4800 MHz



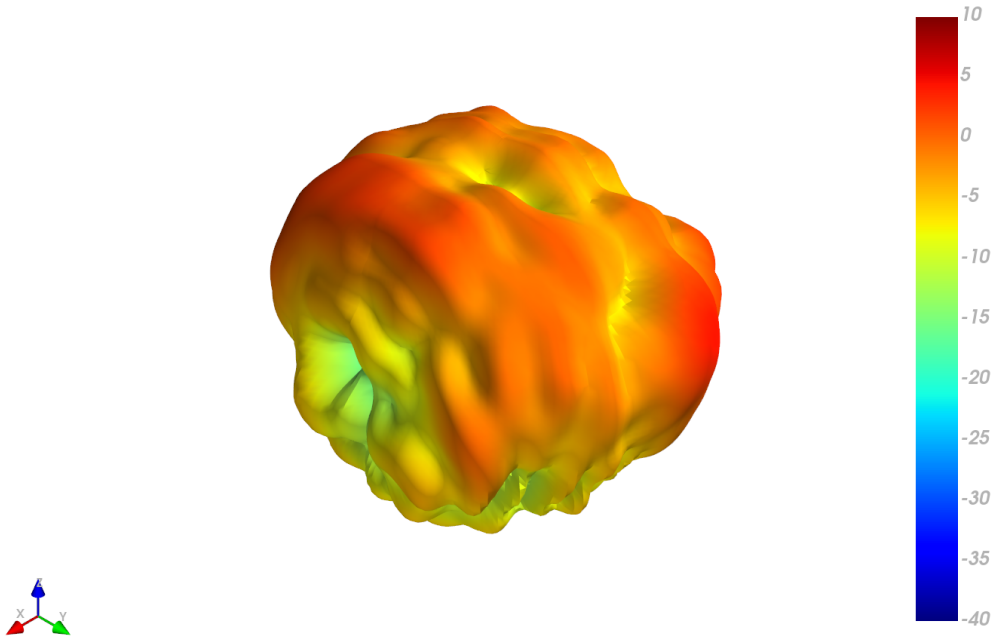
XY Plane	XZ Plane	YZ Plane



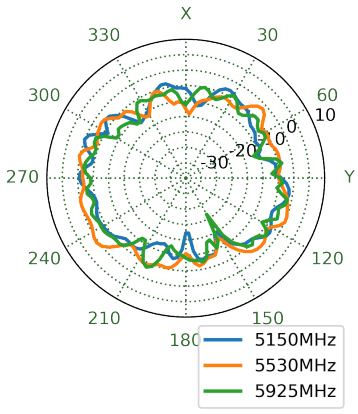


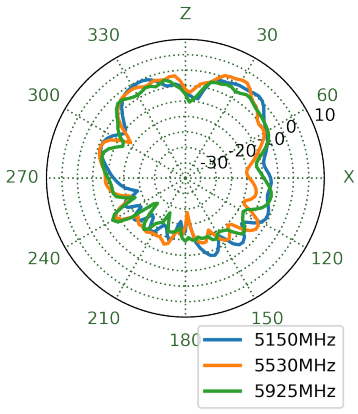


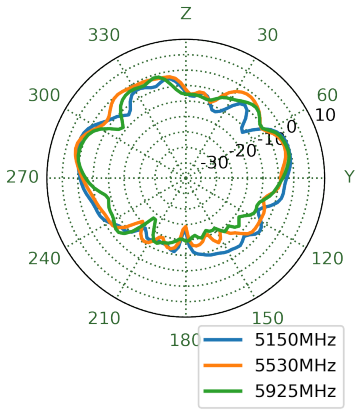
8.55 4G/5G-4 - Patterns at 5530 MHz



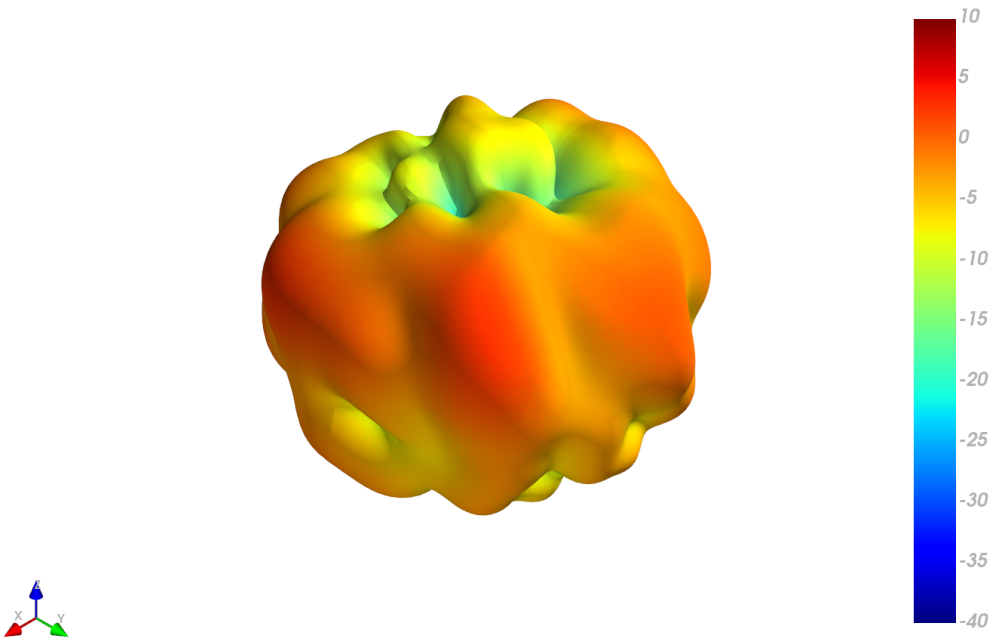
XY Plane	XZ Plane	YZ Plane



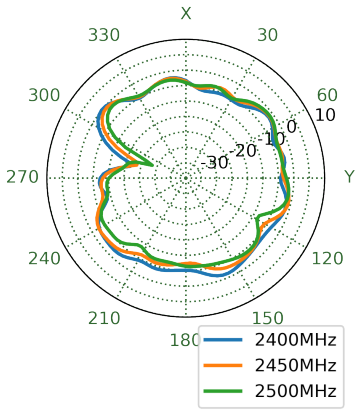


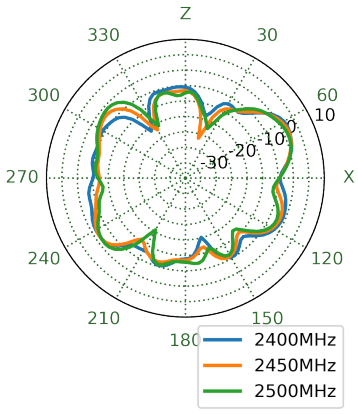


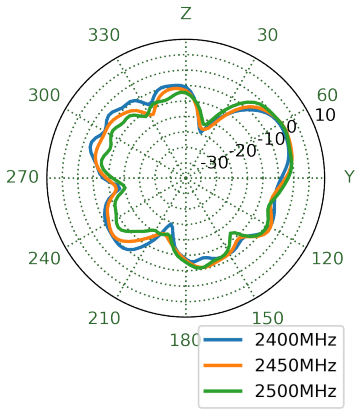
8.56 Wi-Fi-1 - Patterns at 2450 MHz



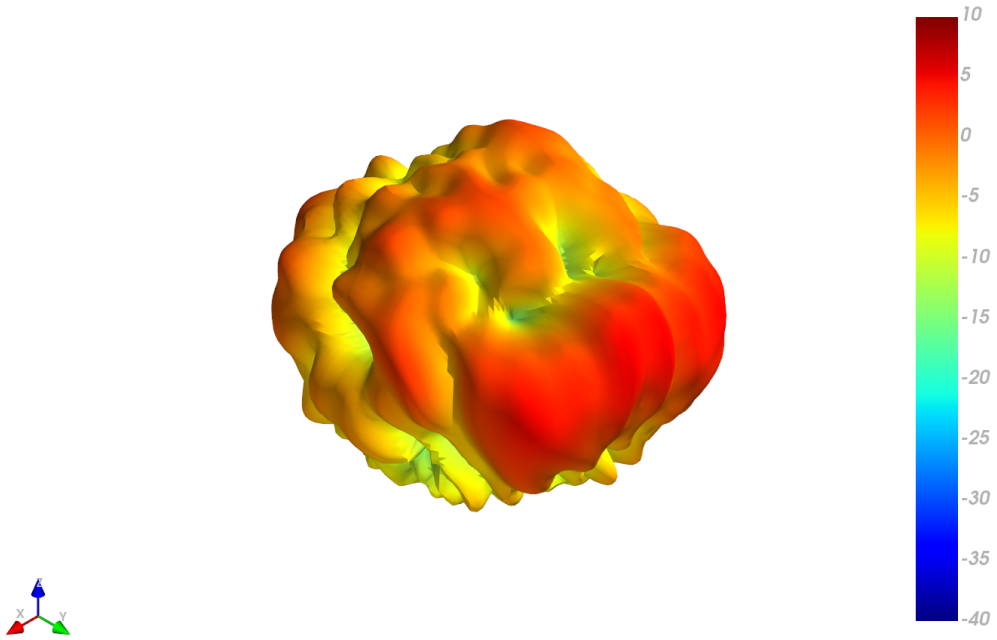
XY Plane	XZ Plane	YZ Plane



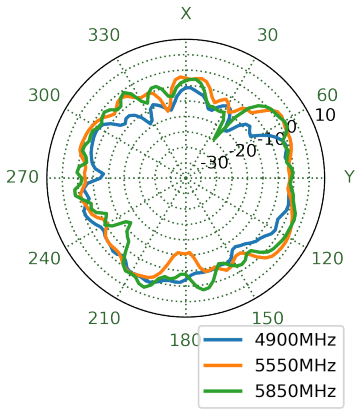


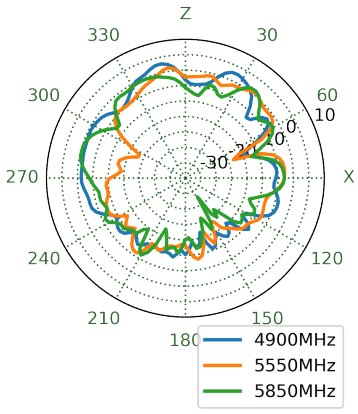


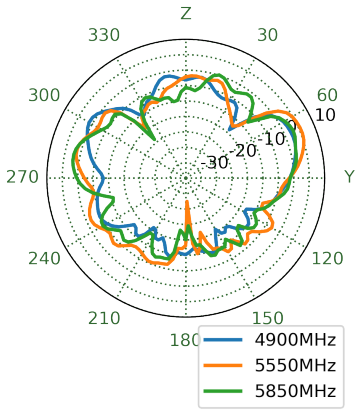
8.57 Wi-Fi-1 - Patterns at 5550 MHz



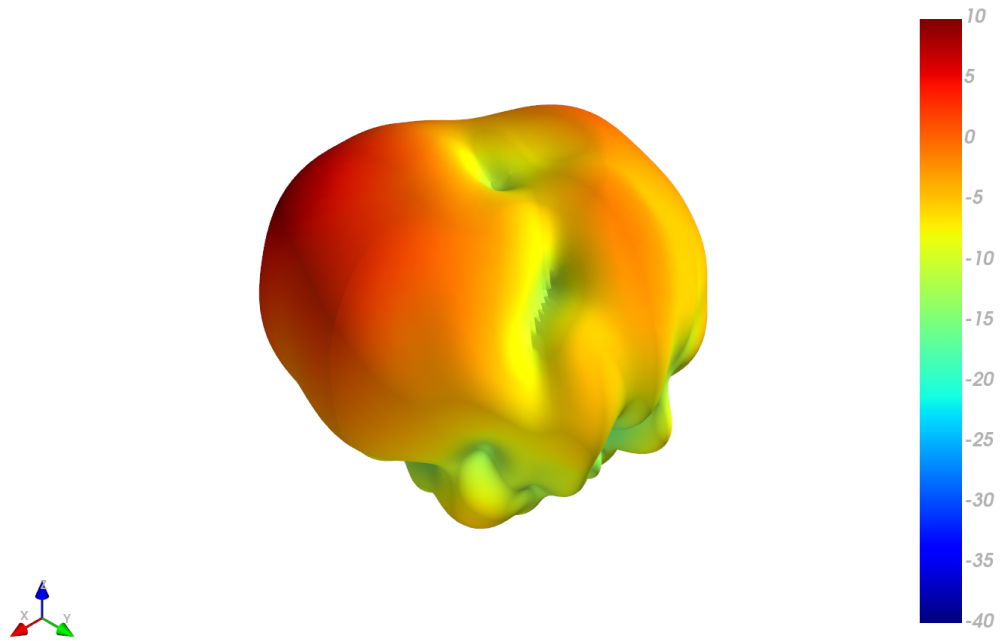
XY Plane	XZ Plane	YZ Plane



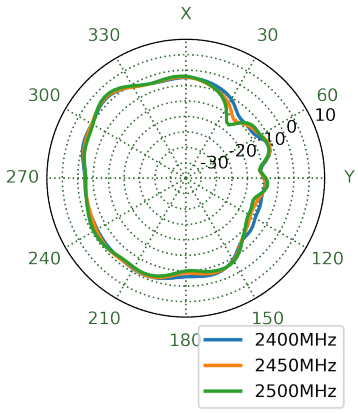


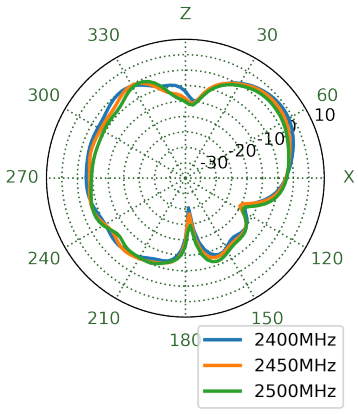


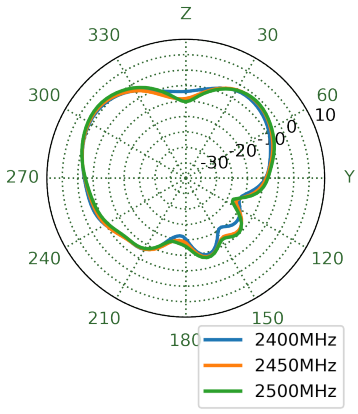
8.58 Wi-Fi-2 - Patterns at 2450 MHz



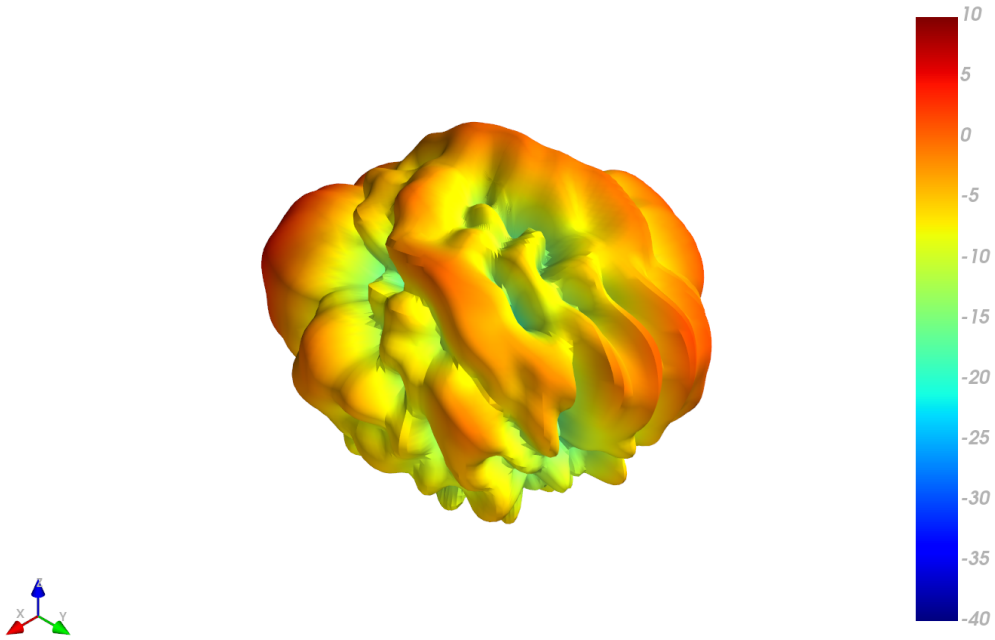
XY Plane	XZ Plane	YZ Plane

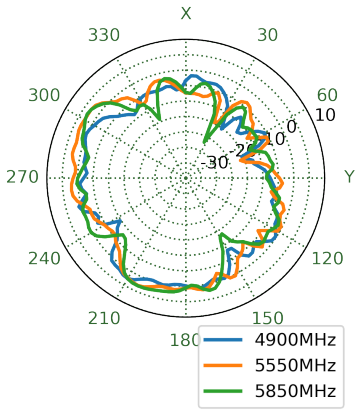
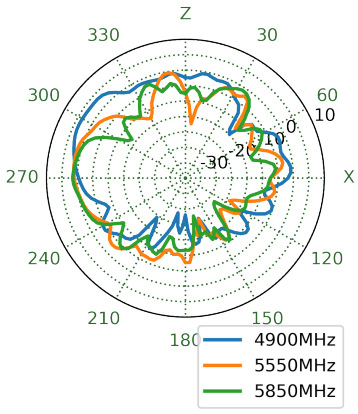
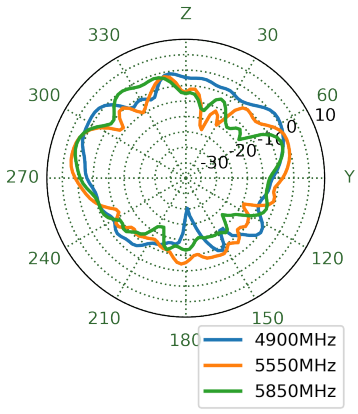




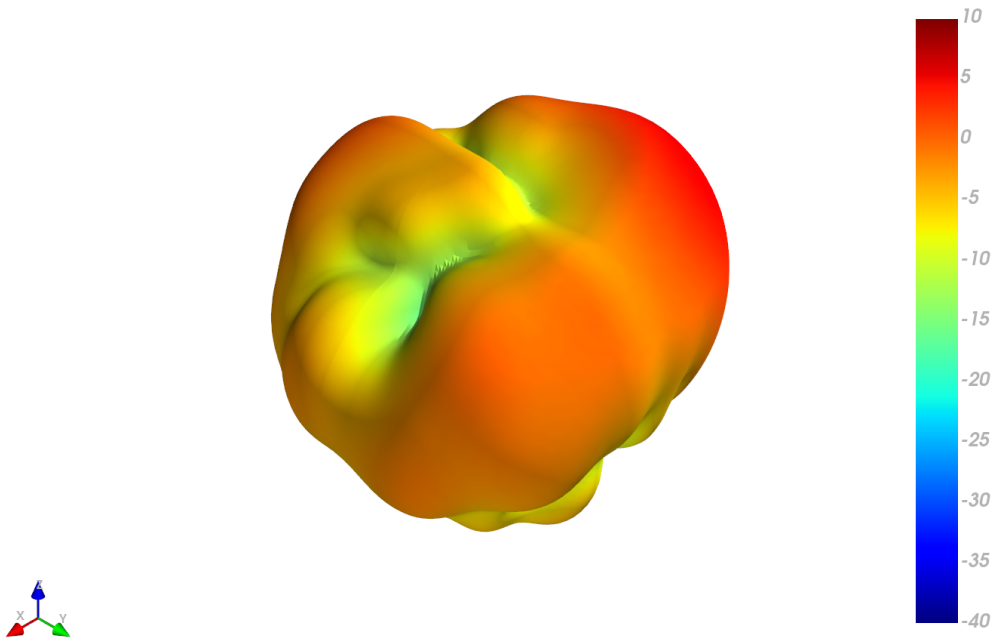


8.59 Wi-Fi-2 - Patterns at 5550 MHz

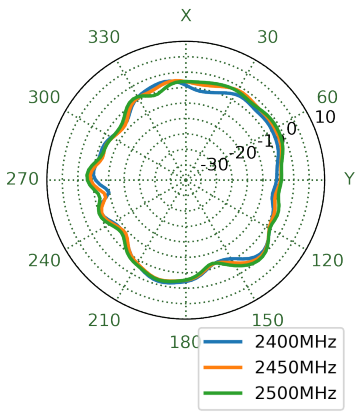


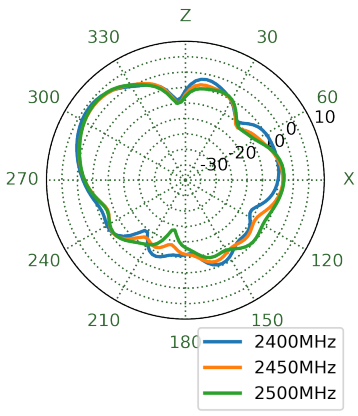
XY Plane	XZ Plane	YZ Plane
		

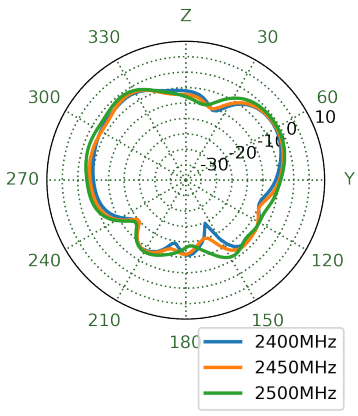
8.60 Wi-Fi-3 - Patterns at 2450 MHz



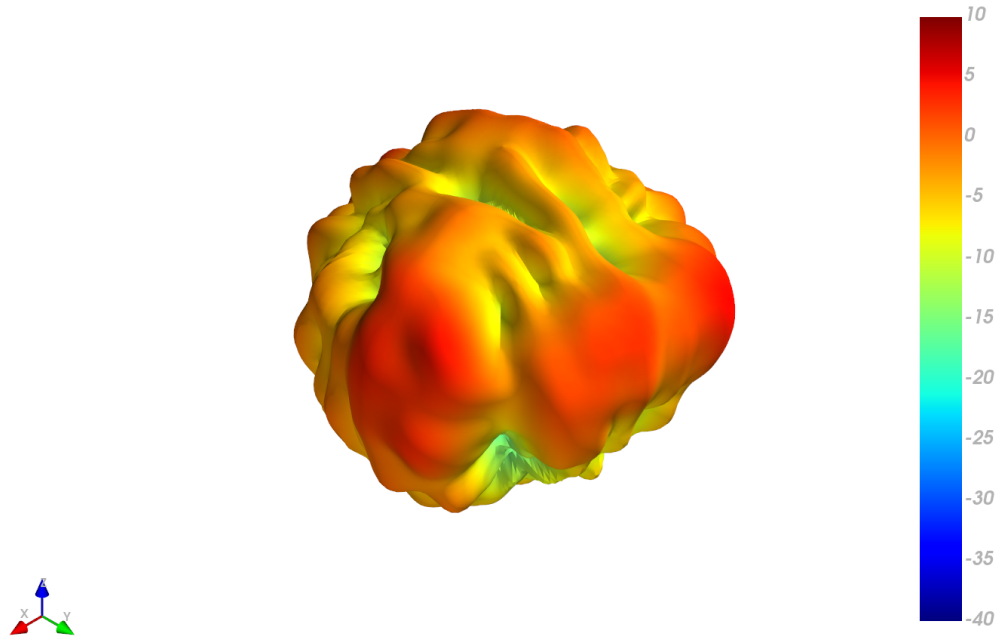
XY Plane	XZ Plane	YZ Plane

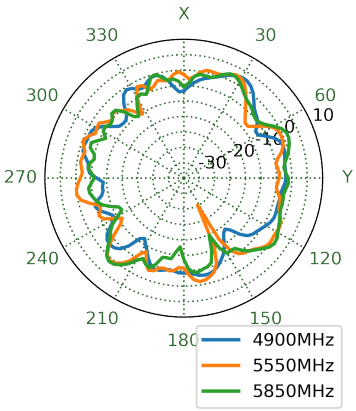
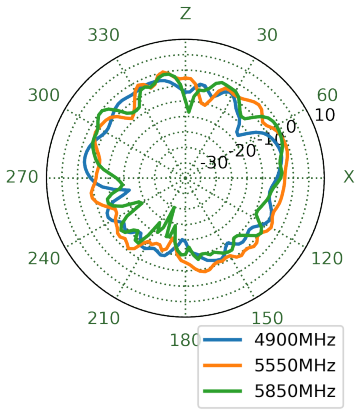
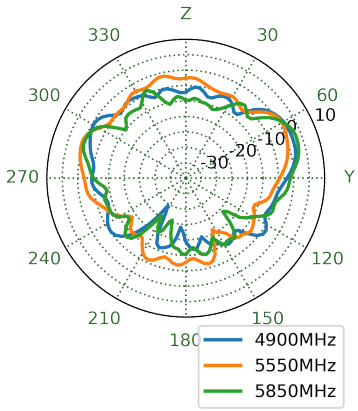




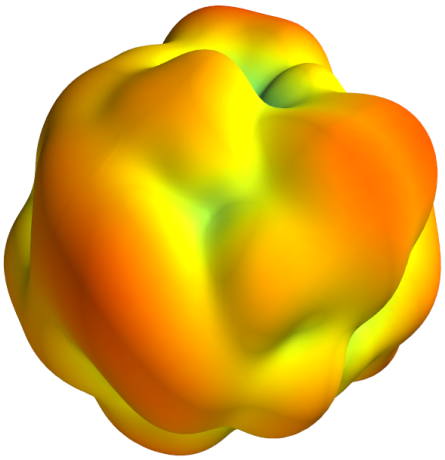


8.61 Wi-Fi-3 - Patterns at 5550 MHz



XY Plane	XZ Plane	YZ Plane
		

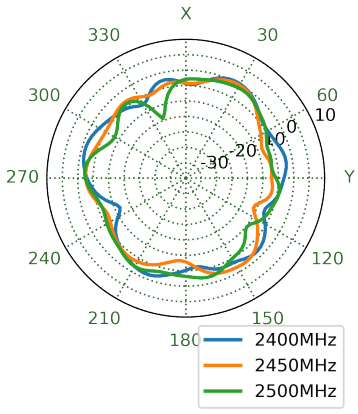
8.62 Wi-Fi-4 - Patterns at 2450 MHz

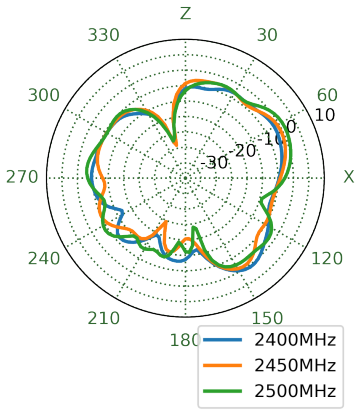


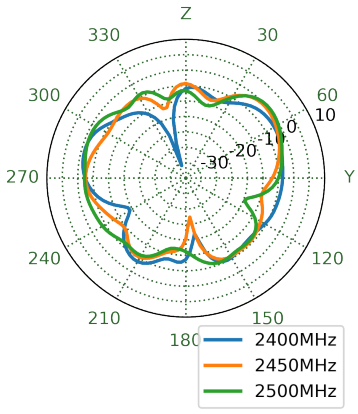




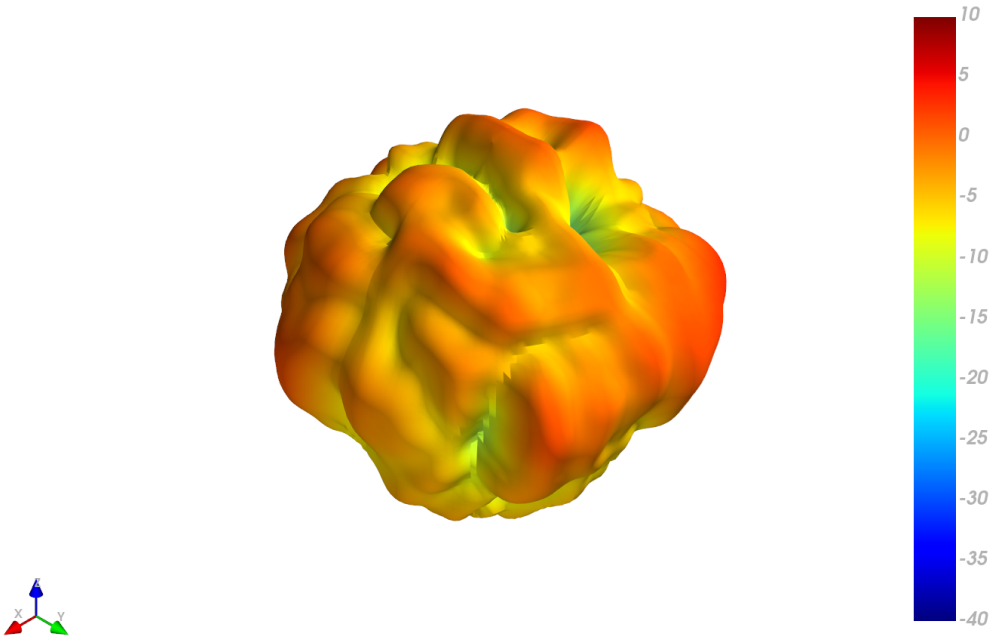
XY Plane	XZ Plane	YZ Plane

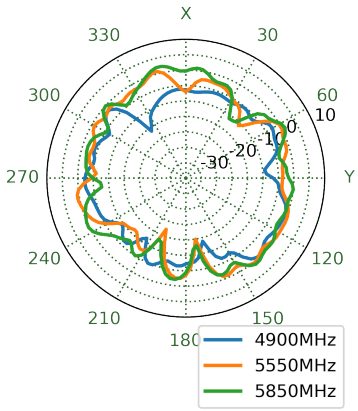
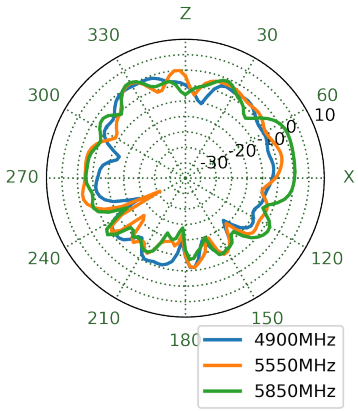
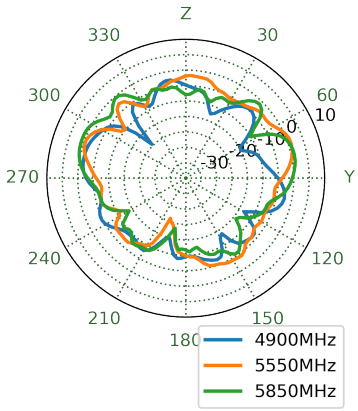




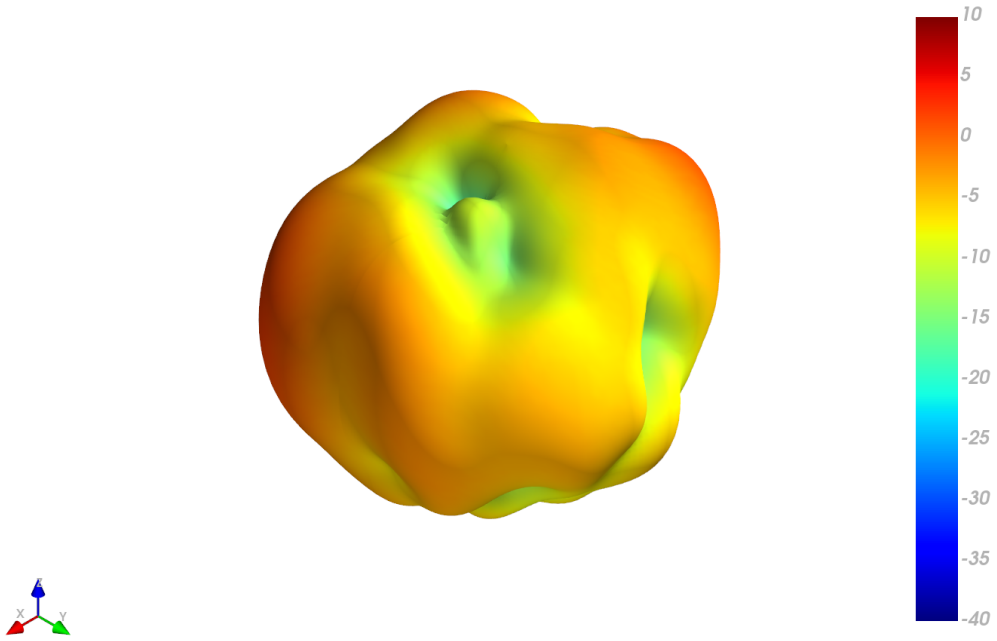


8.63 Wi-Fi-4 - Patterns at 5550 MHz

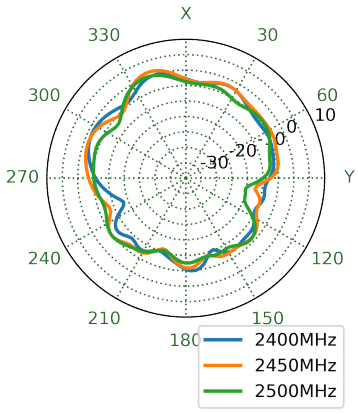


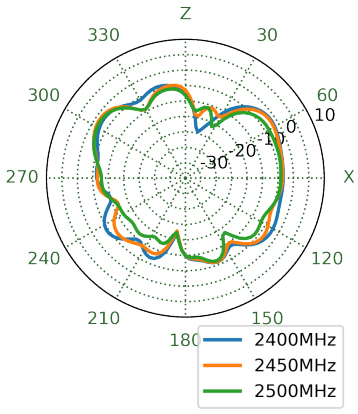
XY Plane	XZ Plane	YZ Plane
		

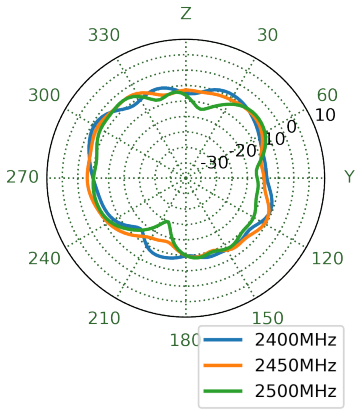
8.64 Wi-Fi-5 - Patterns at 2450 MHz



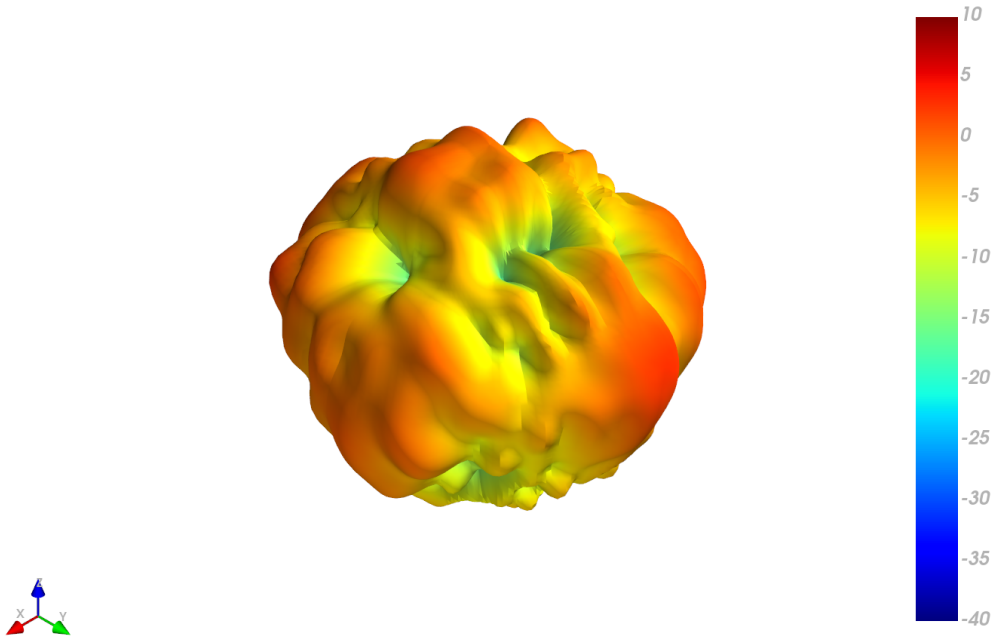
XY Plane	XZ Plane	YZ Plane



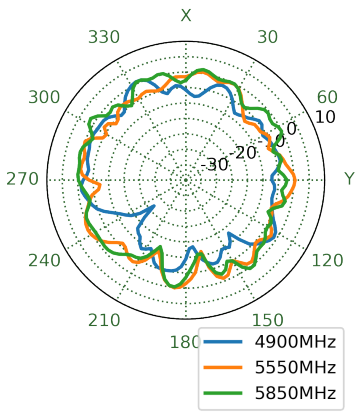


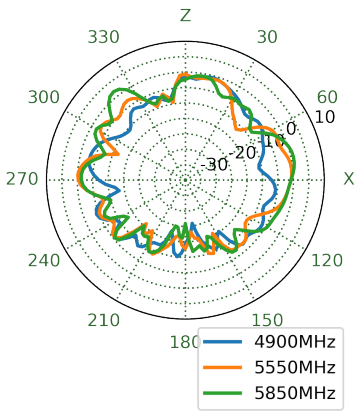


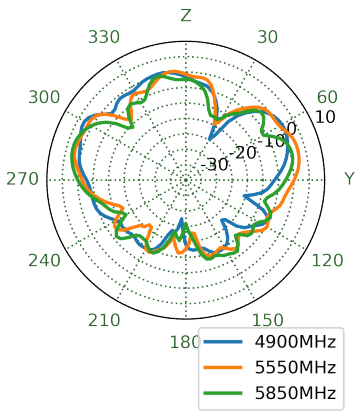
8.65 Wi-Fi-5 - Patterns at 5550 MHz



XY Plane	XZ Plane	YZ Plane







Changelog for the datasheet

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Date:	2026-04-23
Notes:	Initial Release
Author:	Gary West

Previous Revisions

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