TAOGLAS

Datasheet

5G/4G Terminal Mount Monopole Antenna

Part No:
TG.55.8113

Description

5G/4G Terminal Mount Monopole Antenna with 90° Hinged SMA (M) Connector

Features:

Covering Sub 6GHz 5G NR Bands
Covering Worldwide 4G Bands
600MHz-6GHz Bandwidth
High Efficiency up to 80%
3G/2G Fallback with NB-IoT and CAT-M capabilities
90° Hinged Right Angle SMA (M) Connector
Straight Dimensions: 172 x 23.9 x 13 mm
Right Angle Dimensions: 148 x 42.4 x 13 mm
RoHS & REACH Compliant

1. Introduction

The Taoglas TG.55.8113 is a 5G/4G monopole antenna, designed primarily for use with modules and devices that require high efficiency and peak gain. It delivers best in class throughput on all major cellular bands worldwide, perfect for access points, terminals, and routers. The TG.55 covers many 5G NR Sub 6GHz bands including the new Extended LTE Band 71. It has an SMA (M) connector as standard and is an ideal solution for any device requiring reliable performance in a slim form factor.

Typical Applications include:

- Gateways & Routers
- Industrial IoT
- Smart Metering
- Smart Home
- Vending Machines
- Connected Enterprise

The TG.55 exhibits an efficiency of up to 80% across wideband 5G/4G bands and is backward compatible with 3G/2G cellular applications. The TG.55 is a fully omnidirectional antenna as seen in the radiation patterns and is stable across all bands. The SMA (M) connector hinge mechanism allows the antenna to be rotated into the preferred orientation which helps to avoid other antennas or objects. This also helps with isolation by pointing the antennas in different directions when used in MIMO systems or when other antennas are present on the same device. The antenna blade can swivel 90 degrees from the connector accommodating different installation configurations.

The TG.55.8113 is also available with a white enclosure, TG.55.8113W. The connector is also available in FAKRA Code D, TG.55.8723 but can be customized based on an MOQ.

Contact your regional Taoglas customer support team to request these services or additional support to integrate and test this antenna's performance in your device.

2. Specification

Band	Frequency (MHz)	Measurement	Efficiency (%)	Average Gain (dB)	Peak Gain (dBi)	Impedance	Polarization	Radiation Pattern	Max. input power
5GNR/4G Band71	617-698	Bent in Free Space	51.5	-2.88	1.47	50 Ω	Linear	Omni	2W
		Bent on a 9x15cm Ground Plane	17.0	-7.69	-3.62				
		Straight in Free Space	50.3	-2.99	2.44				
		Straight on a 9x15cm Ground Plane	17.7	-7.52	-3.10				
LTE 700	698-824	Bent in Free Space	43.7	-3.60	1.08				
		Bent on a 9x15cm Ground Plane	26.6	-5.74	-1.46				
		Straight in Free Space	47.7	-3.21	2.65				
		Straight on a 9x15cm Ground Plane	25.8	-5.88	0.45				
GSM 850/90	824-960	Bent in Free Space	50.8	-2.94	3.33				
		Bent on a 9x15cm Ground Plane	57.2	-2.42	1.12				
		Straight in Free Space	52.2	-2.82	3.37				
		Straight on a 9x15cm Ground Plane	54.5	-2.64	2.48				
5GNR/4G Band 21,32,74,75,76	1427-1518	Bent in Free Space	55.0	-2.60	2.26				
		Bent on a 9x15cm Ground Plane	64.3	-1.92	2.00				
		Straight in Free Space	54.7	-2.62	4.14				
		Straight on a 9x15cm Ground Plane	63.6	-1.96	3.50				
GNSS E1/B1/G1/L1	1559-1610	Bent in Free Space	69.6	-1.57	2.25				
		Bent on a 9x15cm Ground Plane	78.6	-1.05	2.95				
		Straight in Free Space	69.0	-1.61	3.02				
		Straight on a 9x15cm Ground Plane	79.0	-1.03	3.64				
DCS	1710-1880	Bent in Free Space	87.4	-0.58	3.99				
		Bent on a 9x15cm Ground Plane	84.4	-0.74	3.11				
		Straight in Free Space	84.2	-0.75	3.38				
		Straight on a 9x15cm Ground Plane	75.4	-1.23	2.93				
UMTS1	1920-2170	Bent in Free Space	78.3	-1.06	3.12				
		Bent on a 9x15cm Ground Plane	75.1	-1.25	2.81				
		Straight in Free Space	74.6	-1.27	3.64				
		Straight on a 9x15cm Ground Plane	74.1	-1.30	4.43				
LTE 2600	2300-2690	Bent in Free Space	68.4	-1.65	3.37				
		Bent on a 9x15cm Ground Plane	66.4	-1.78	2.85				
		Straight in Free Space	68.4	-1.65	4.89				
		Straight on a 9x15cm Ground Plane	66.2	-1.79	4.36				
5G NR B 77,78,79	3300-5000	Bent in Free Space	79.4	-1.00	5.00				
		Bent on a 9x15cm Ground Plane	74.0	-1.31	5.39				
		Straight in Free Space	82.9	-0.82	4.75				
		Straight on a 9x15cm Ground Plane	75.6	-1.21	4.96				
LTE 5200	5150-5925	Bent in Free Space	62.8	-2.02	5.23				
		Bent on a 9x15cm Ground Plane	56.3	-2.49	4.76				
		Straight in Free Space	60.1	-2.21	4.06				
		Straight on a 9x15cm Ground Plane	58.5	-2.33	4.52				

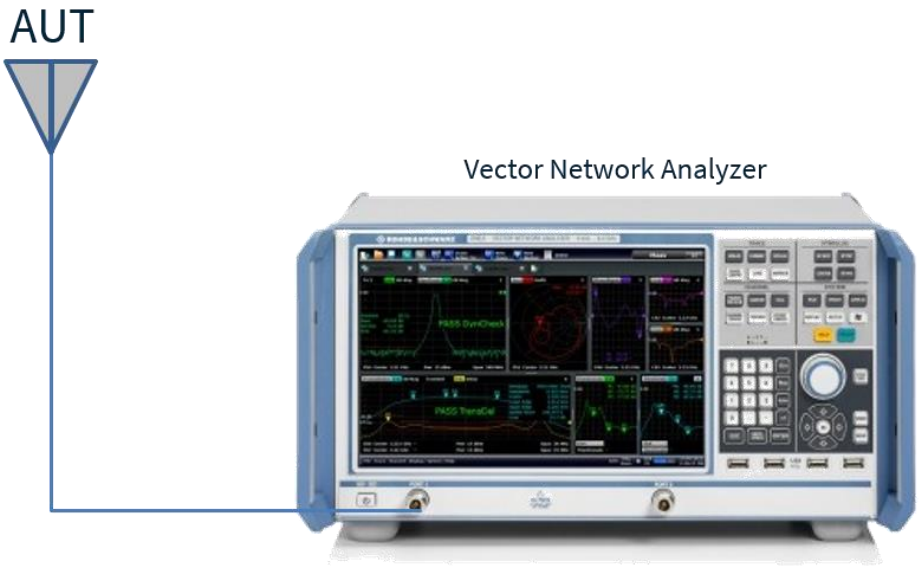
5G/4G Bands						
Band Number	5GNR / FR1 / LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA					
	Uplink	Downlink	Bent in Free Space	Bent on a 9x15cm Ground Plane	Straight in Free Space	Straight on a 9x15cm Ground Plane
B1	1920 to 1980	2110 to 2170	✓	✓	✓	✓
B2	1850 to 1910	1930 to 1990	✓	✓	✓	✓
B3	1710 to 1785	1805 to 1880	✓	✓	✓	✓
B4	1710 to 1755	2110 to 2155	✓	✓	✓	✓
B5	824 to 849	869 to 894	✓	✓	✓	✓
B7	2500 to 2570	2620 to 2690	✓	✓	✓	✓
B8	880 to 915	925 to 960	✓	✓	✓	✓
B9*	1749.9 to 1784.9	1844.9 to 1879.9	✓	✓	✓	✓
B11	1427.9 to 1447.9	1475.9 to 1495.9	✓	✓	✓	✓
B12	699 to 716	729 to 746	✓	✓	✓	✓
B13	777 to 787	746 to 756	✓	✓	✓	✓
B14	788 to 798	758 to 768	✓	✓	✓	✓
B17	704 to 716	734 to 746	✓	✓	✓	✓
B18	815 to 830	860 to 875	✓	✓	✓	✓
B19	830 to 845	875 to 890	✓	✓	✓	✓
B20	832 to 862	791 to 821	✓	✓	✓	✓
B21	1447.9 to 1462.9	1495.9 to 1510.9	✓	✓	✓	✓
B22*	3410 to 3490	3510 to 3590	✓	✓	✓	✓
B23*	2000 to 2020	2180 to 2200	✓	✓	✓	✓
B24	1626.5 to 1660.5	1525 to 1559	✓	✓	✓	✓
B25	1850 to 1915	1930 to 1995	✓	✓	✓	✓
B26	814 to 849	859 to 894	✓	✓	✓	✓
B27*	807 to 824	852 to 869	✓	✓	✓	✓
B28	703 to 748	758 to 803	✓	✓	✓	✓
B29	717 to 728		✓	✓	✓	✓
B30	2305 to 2315	2350 to 2360	✓	✓	✓	✓
B31	452.5 to 457.5	462.5 to 467.5	✗	✗	✗	✗
B32	1452 to 1496		✓	✓	✓	✓
B34	2010 to 2025		✓	✓	✓	✓
B35	1850 to 1910		✓	✓	✓	✓
B36	1930 to 1990		✓	✓	✓	✓
B37	1910 to 1930		✓	✓	✓	✓
B38	2570 to 2620		✓	✓	✓	✓
B39	1880 to 1920		✓	✓	✓	✓
B40	2300 to 2400		✓	✓	✓	✓
B41	2496 to 2690		✓	✓	✓	✓
B42	3400 to 3600		✓	✓	✓	✓
B43	3600 to 3800		✓	✓	✓	✓
B45	1447 to 1467		✓	✓	✓	✓
B46	5150 to 5925		✓	✓	✓	✓
B47	5855 to 5925		✓	✓	✓	✓
B48	3550 to 3700		✓	✓	✓	✓
B49	3550 to 3700		✓	✓	✓	✓
B50	1432 to 1517		✓	✓	✓	✓
B51	1427 to 1432		✓	✓	✓	✓
B52	3300 to 3400		✓	✓	✓	✓
B53	2483.5 to 2495		✓	✓	✓	✓
B65	1920 to 2010	2110 to 2200	✓	✓	✓	✓
B66	1710 to 1780	2110 to 2200	✓	✓	✓	✓
B68	698 to 728	753 to 783	✓	✓	✓	✓
B69	2570 to 2620		✓	✓	✓	✓
B70	1695 to 1710	1995 to 2020	✓	✓	✓	✓
B71	663 to 698	617 to 652	✓	✓	✓	✓
B72	451 to 456	461 to 466	✗	✗	✗	✗
B73	450 to 455	460 to 465	✗	✗	✗	✗
B74	1427 to 1470	1475 to 1518	✓	✓	✓	✓
B75	1432 to 1517		✓	✓	✓	✓
B76	1427 to 1432		✓	✓	✓	✓
B77	3300 to 4200		✓	✓	✓	✓
B78	3300 to 3800		✓	✓	✓	✓
B79	4400 to 5000		✓	✓	✓	✓
B85	698 to 716	728 to 746	✓	✓	✓	✓
B87	410 to 415	420 to 425	✗	✗	✗	✗
B88	412 to 417	422 to 427	✗	✗	✗	✗

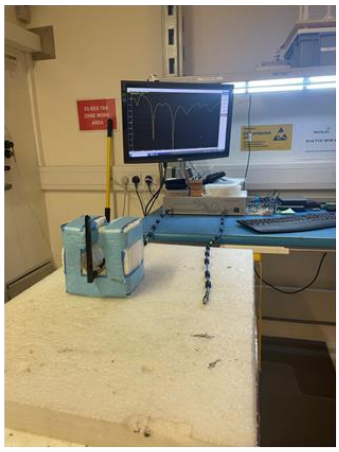
Mechanical	
SMA Connector Diameter	13mm
Planner Dimension	172mm * 23.88mm
Casing	ABS + PC
Connector	SMA (M)
Weight	24.3g

Environmental	
Operation Temperature	-40°C to 85°C
Storage Temperature	-40°C to 85°C
Relative Humidity	Non-condensing 65°C 95% RH

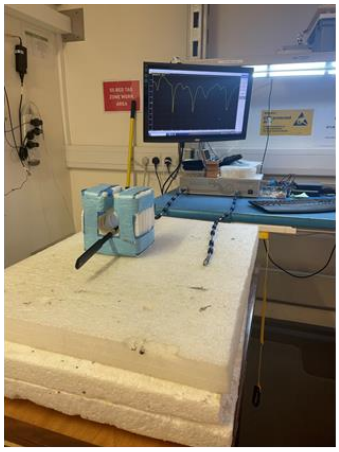
3. Antenna Characteristics

3.1 Test Setup

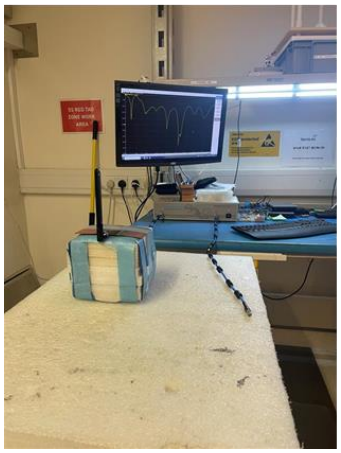




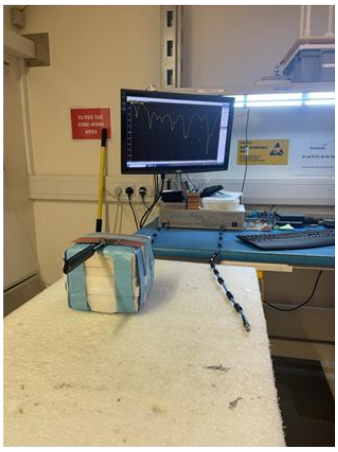
VNA Setup Bent in Free Space



VNA Setup Straight in Free Space

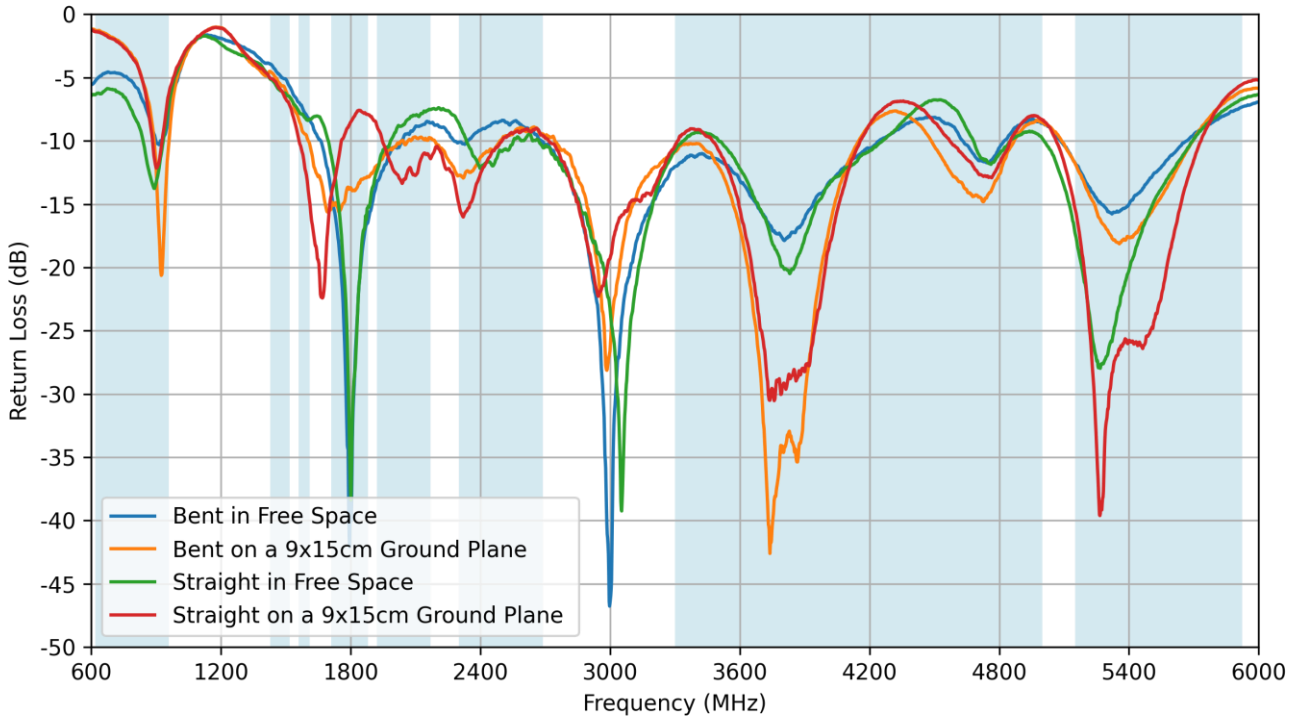


VNA Setup Bent on a 9x15cm Ground Plane

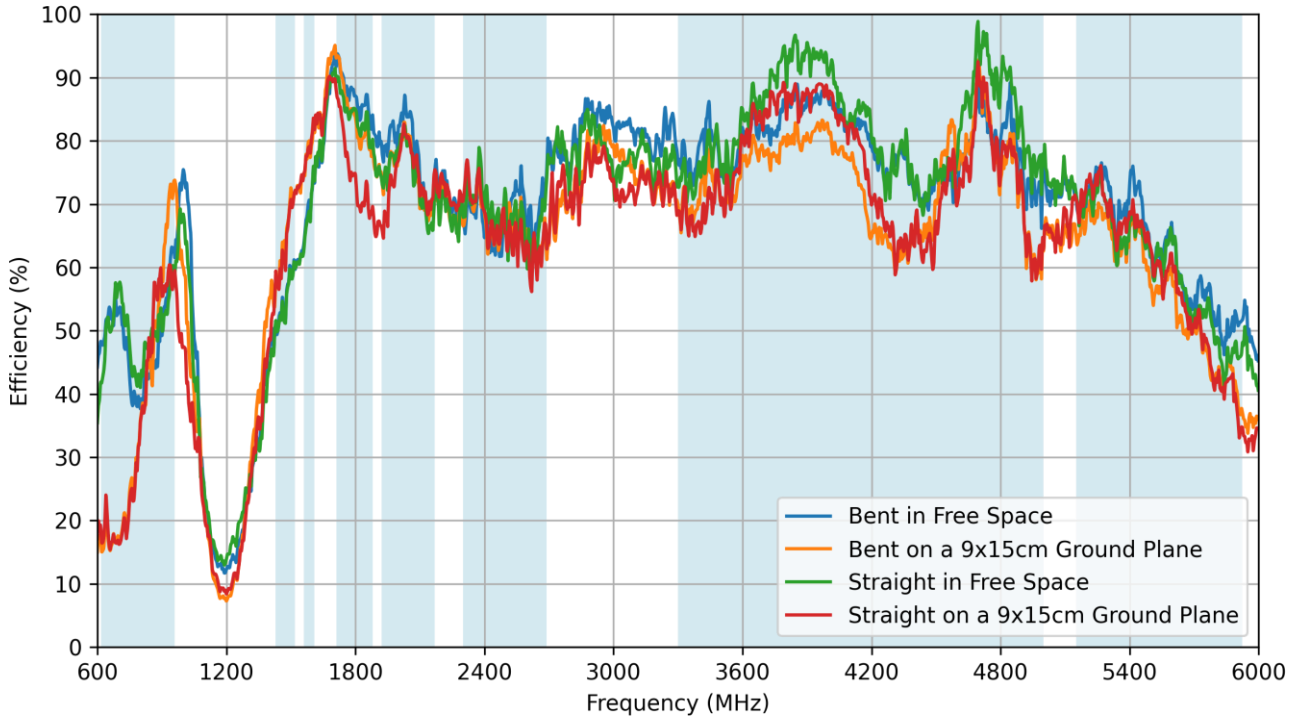


VNA Setup Straight on a 9x15cm Ground Plane

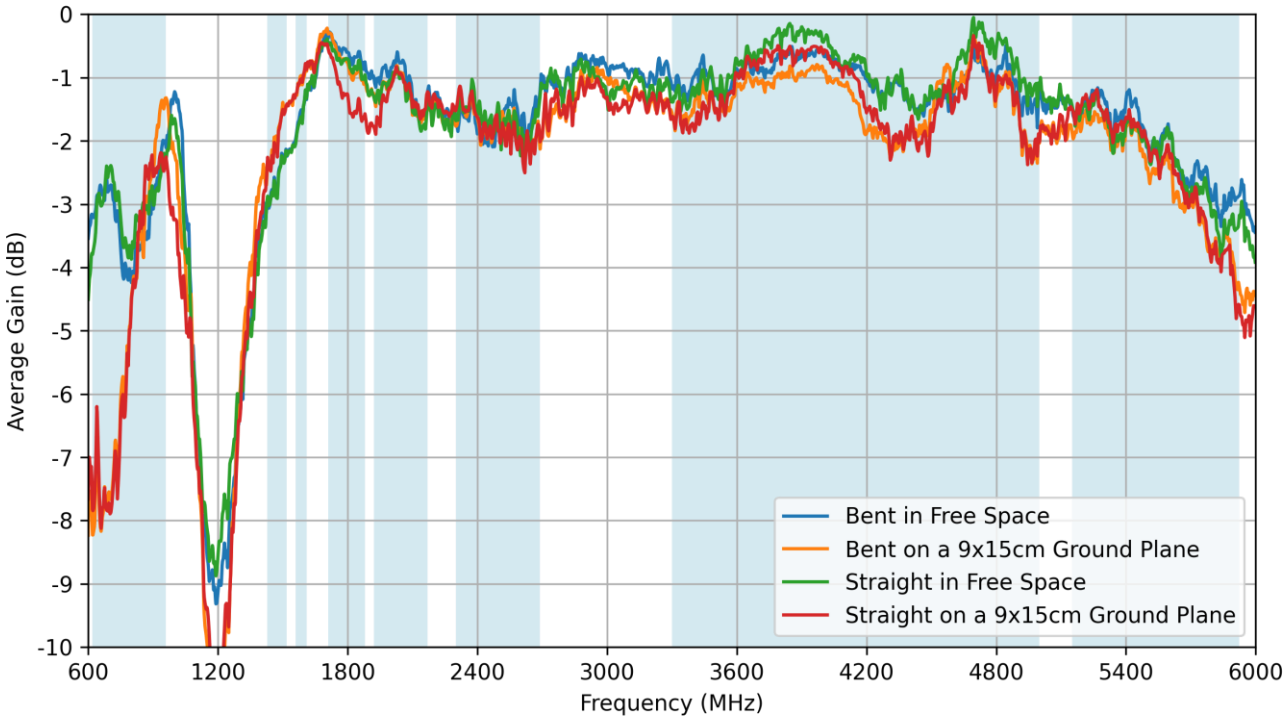
3.2 Return Loss



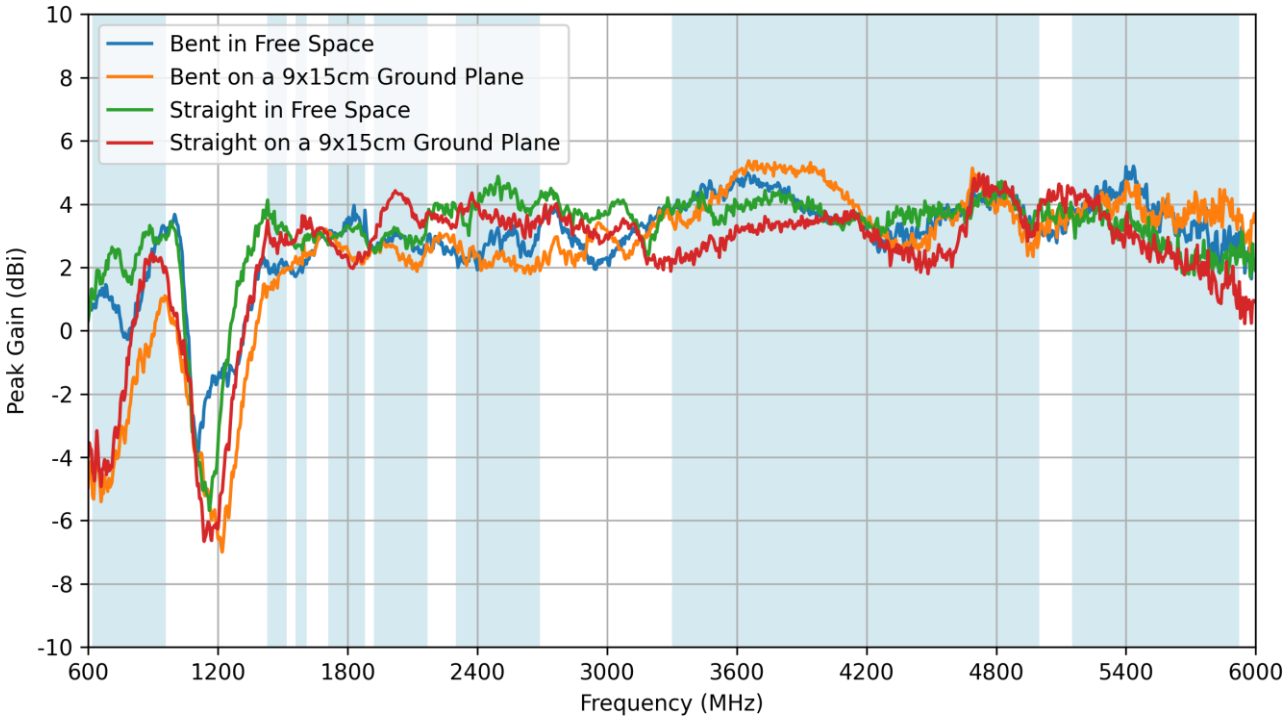
3.3 Efficiency



3.4 Average Gain

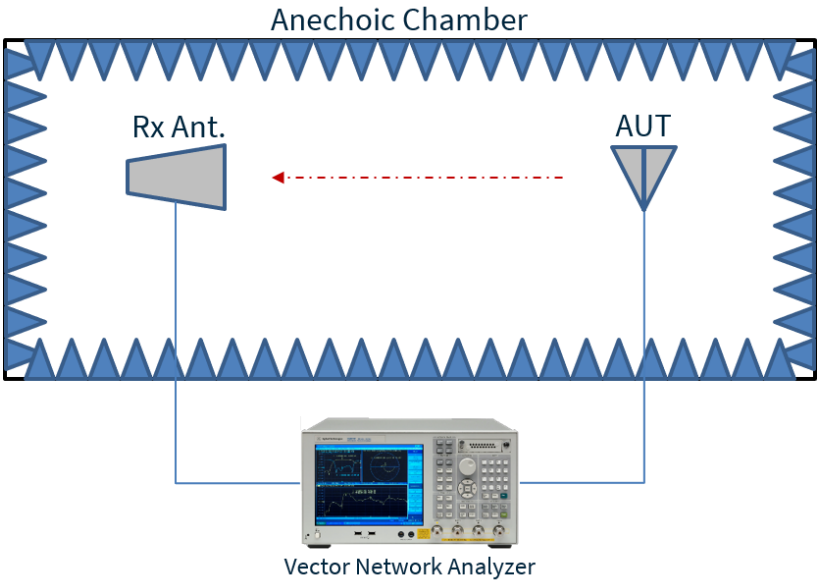


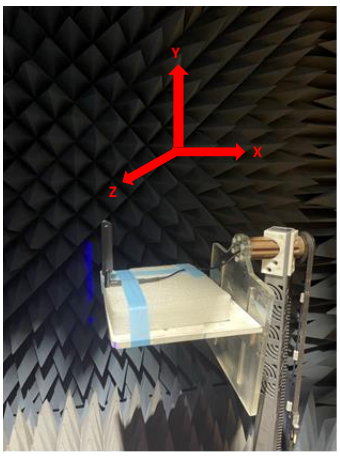
3.5 Peak Gain



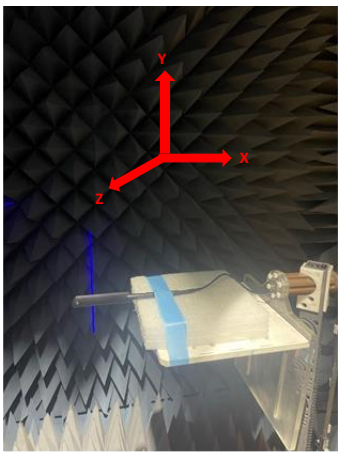
4. Radiation Patterns

4.1 Test Setup

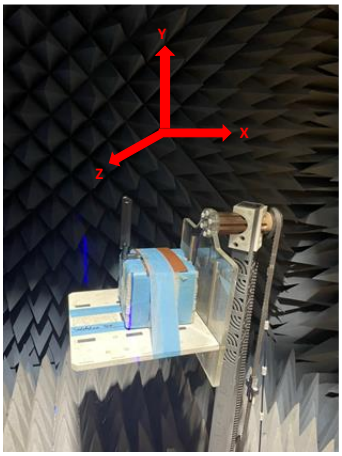




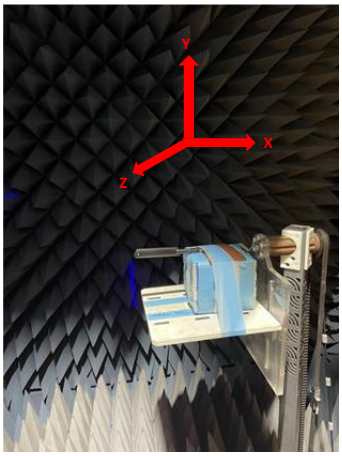
Chamber Setup Bent
in Free Space



Chamber Setup Straight
in Free Space

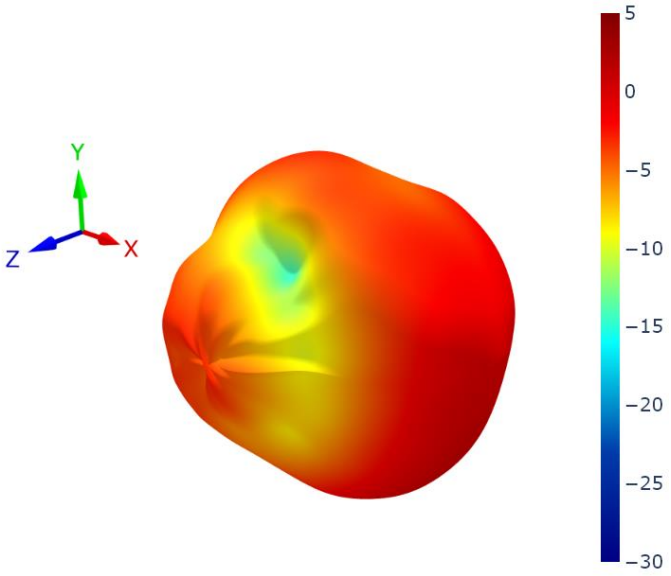


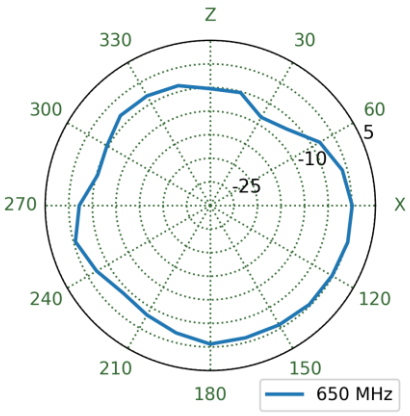
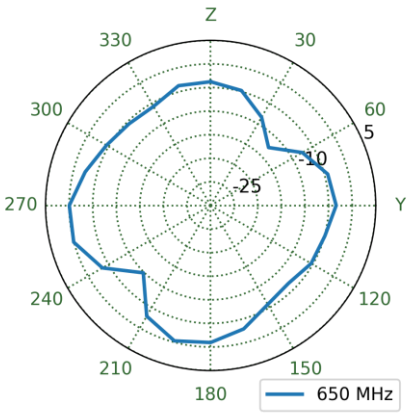
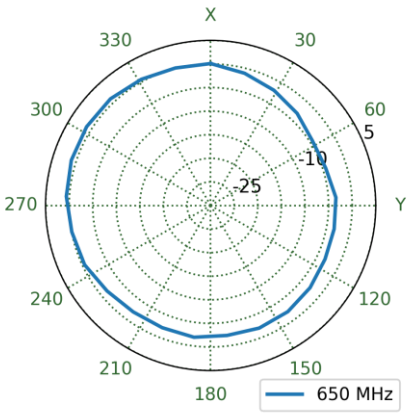
Chamber Setup Bent on a
9x15cm Ground Plane



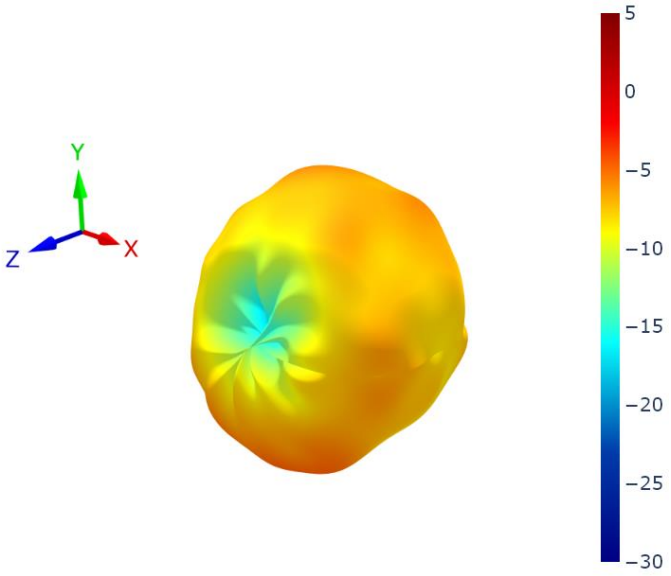
Chamber Setup Straight on a
9x15cm Ground Plane

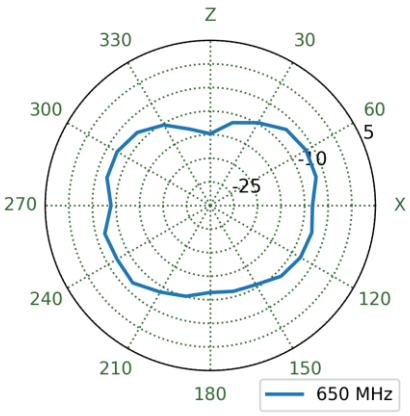
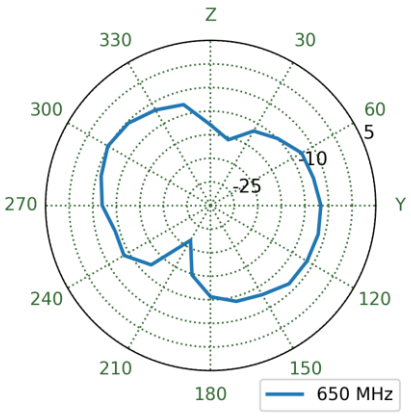
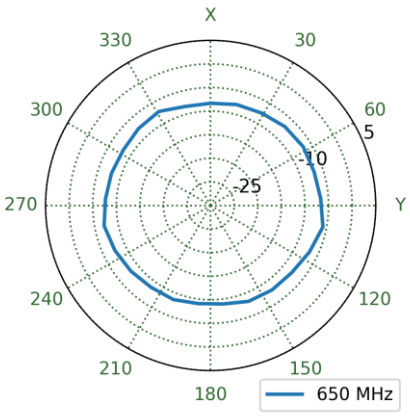
4.2 Bent in Free Space Patterns at 650 MHz



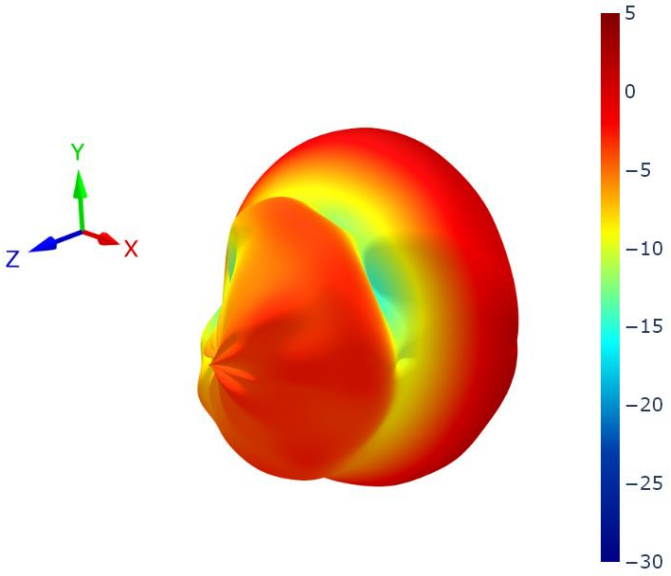
XZ Plane	YZ Plane	XY Plane
		

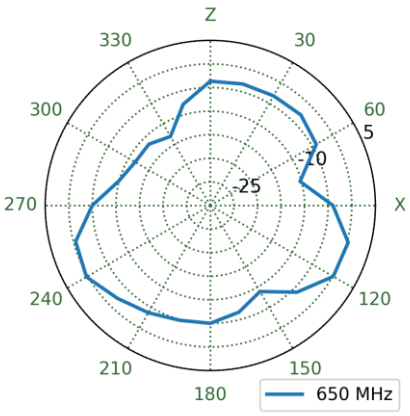
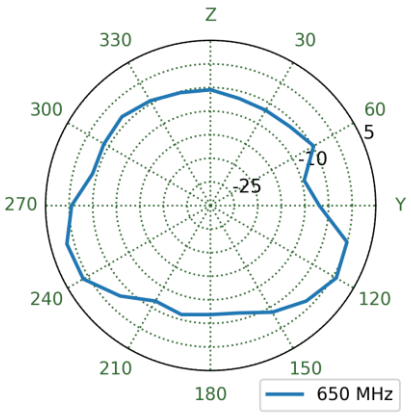
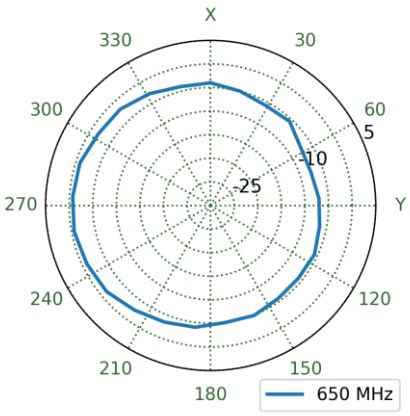
4.3 Bent on a 9x15cm Ground Plane Patterns at 650 MHz



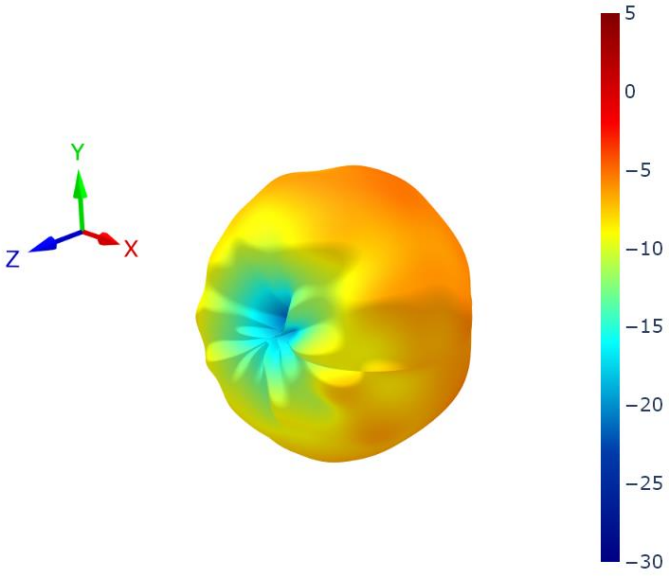
XZ Plane	YZ Plane	XY Plane
		

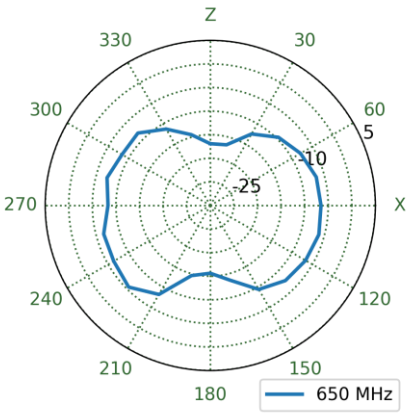
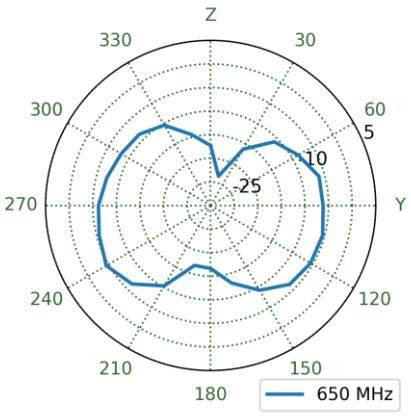
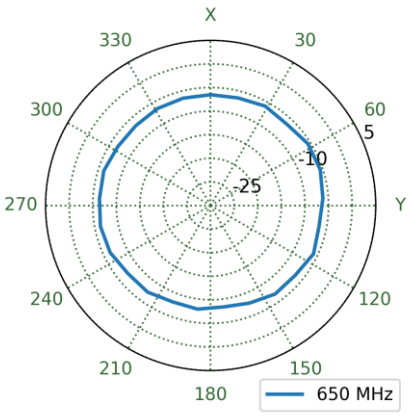
4.4 Straight in Free Space Patterns at 650 MHz



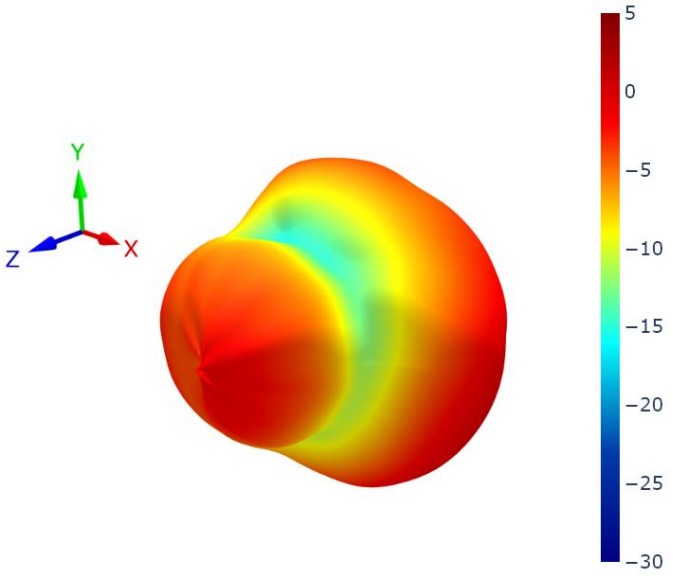
XZ Plane	YZ Plane	XY Plane
		

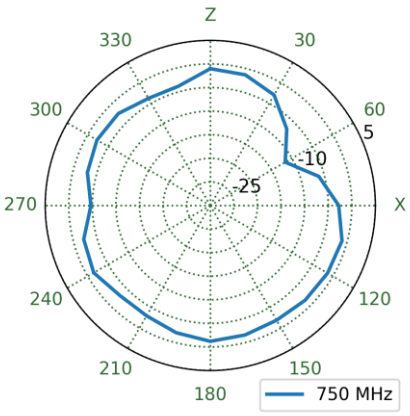
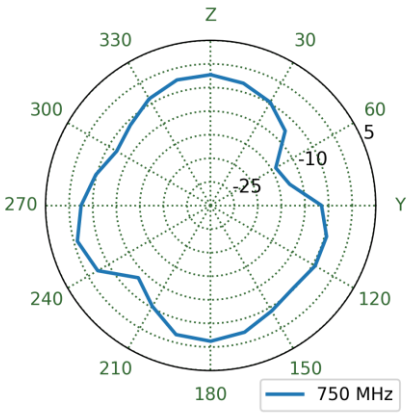
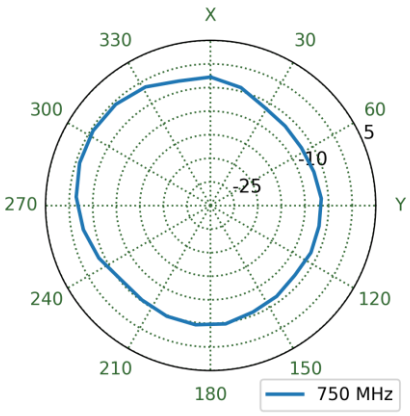
4.5 Straight on a 9x15cm Ground Plane Patterns at 650 MHz



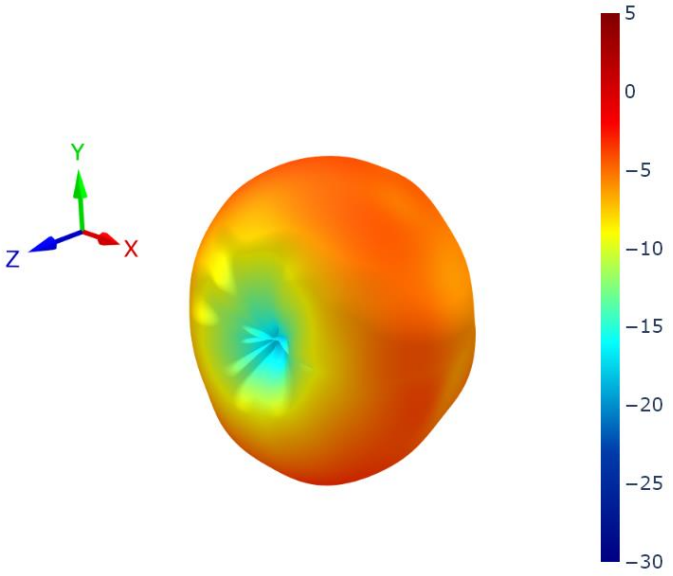
XZ Plane	YZ Plane	XY Plane
		

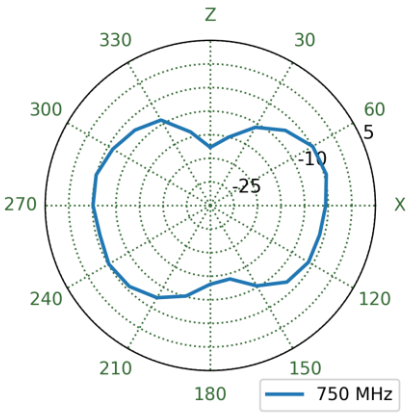
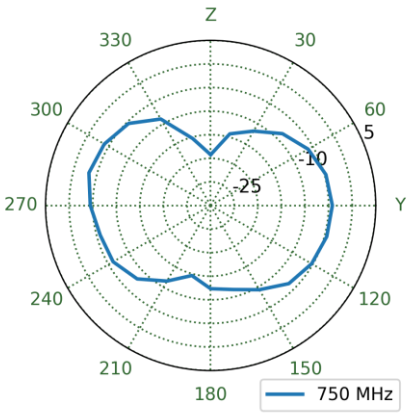
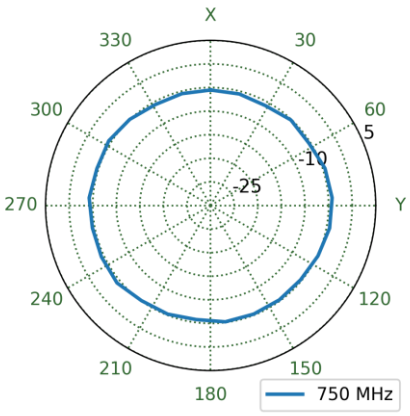
4.6 Bent in Free Space Patterns at 750 MHz



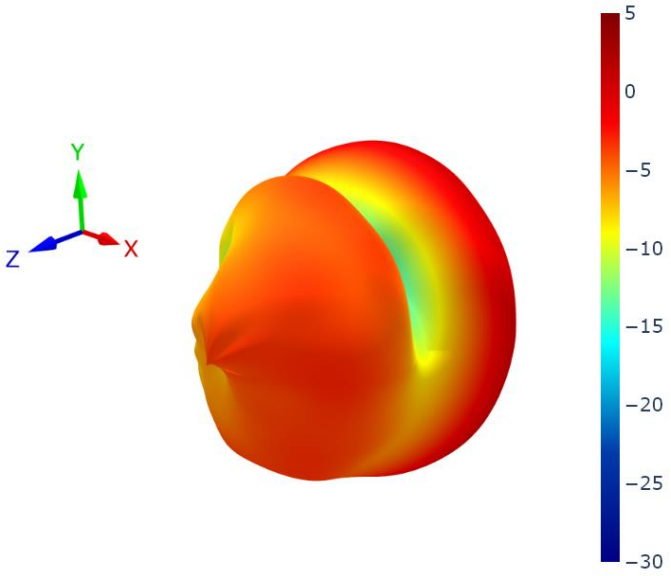
XZ Plane	YZ Plane	XY Plane
		

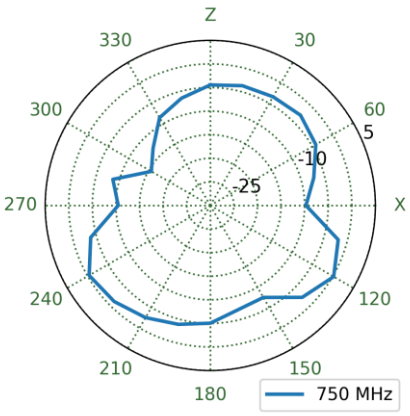
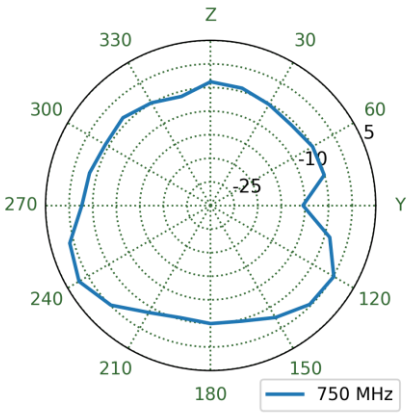
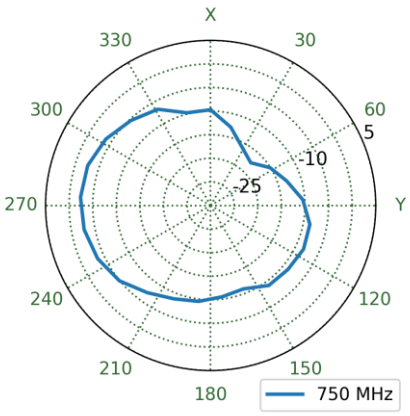
4.7 Bent on a 9x15cm Ground Plane Patterns at 750 MHz



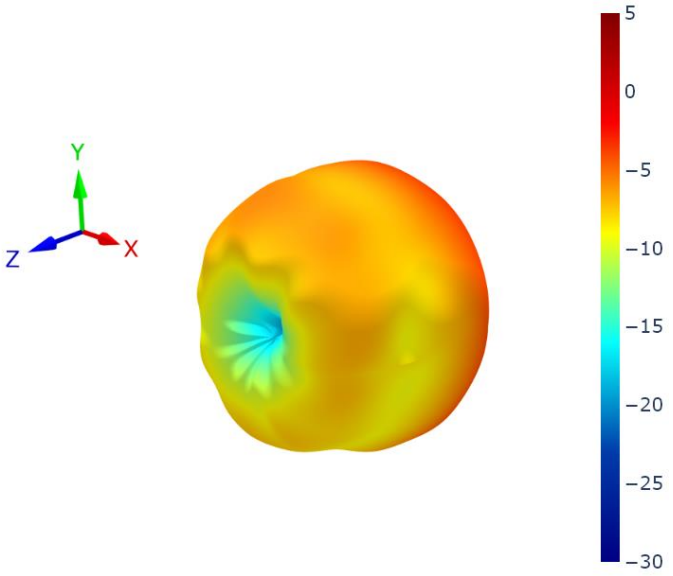
XZ Plane	YZ Plane	XY Plane
		

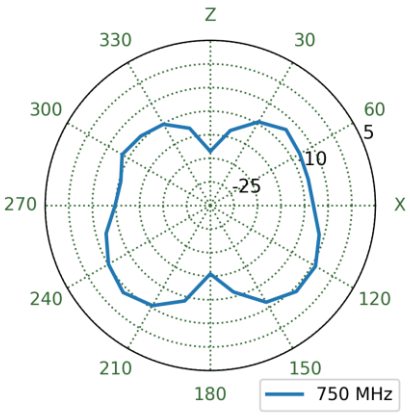
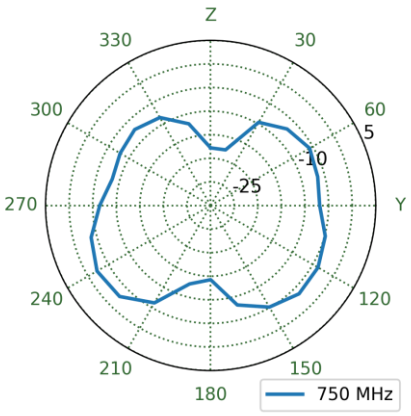
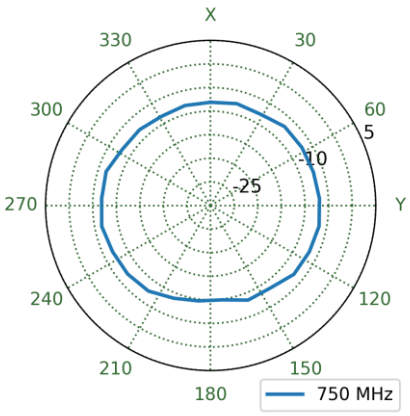
4.8 Straight in Free Space Patterns at 750 MHz



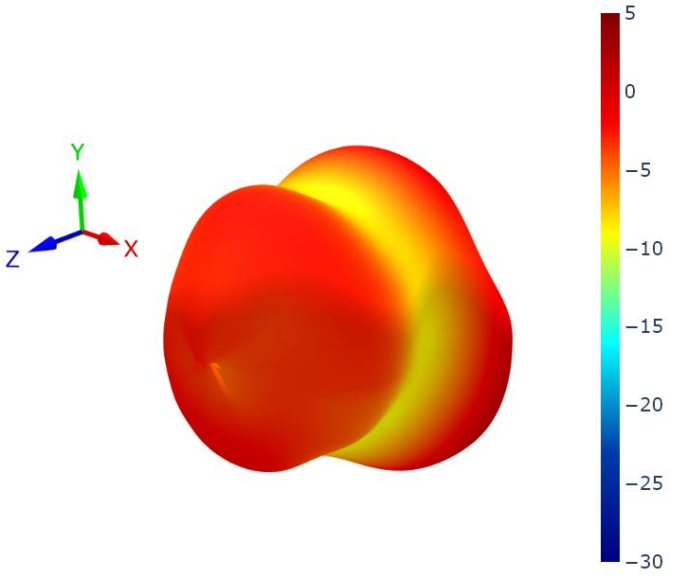
XZ Plane	YZ Plane	XY Plane
		

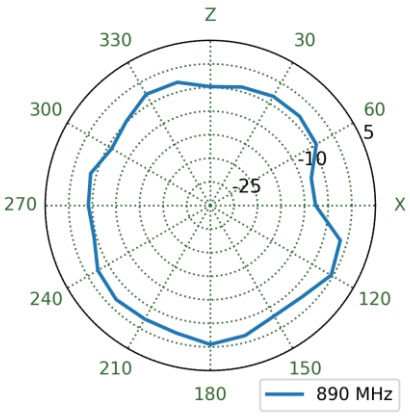
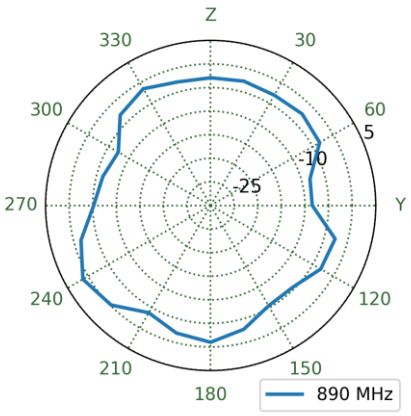
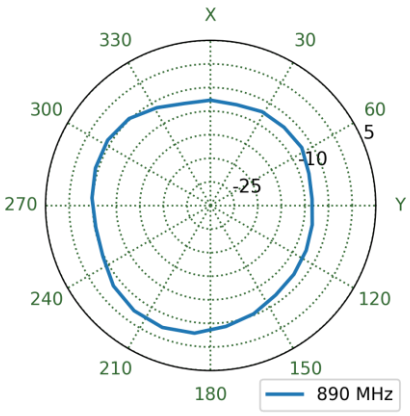
4.9 Straight on a 9x15cm Ground Plane Patterns at 750 MHz



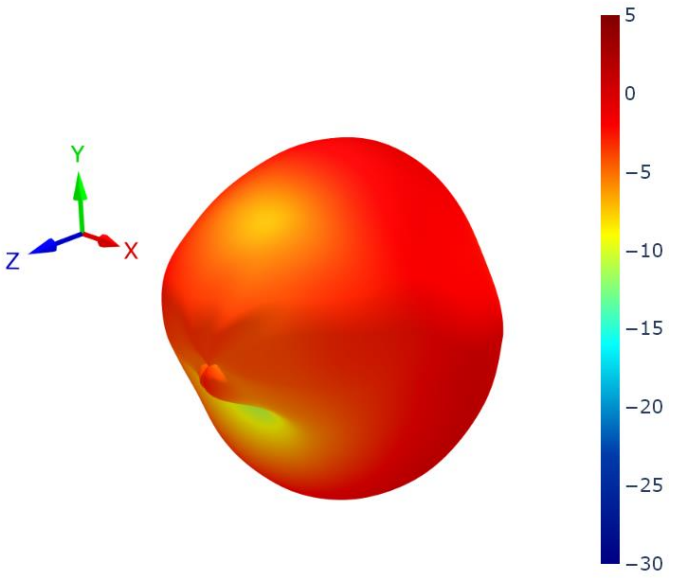
XZ Plane	YZ Plane	XY Plane
		

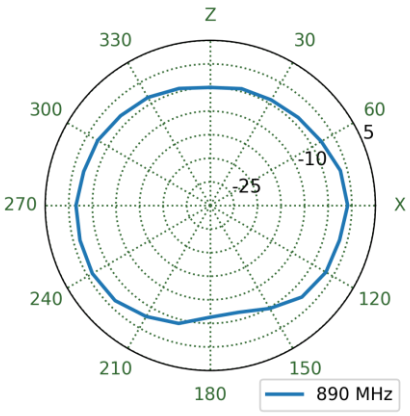
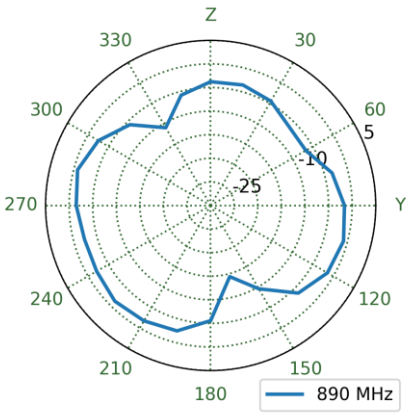
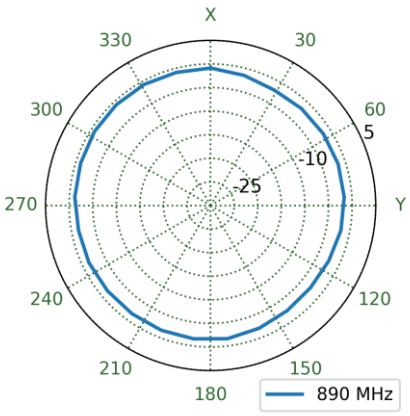
4.10 Bent in Free Space Patterns at 890 MHz



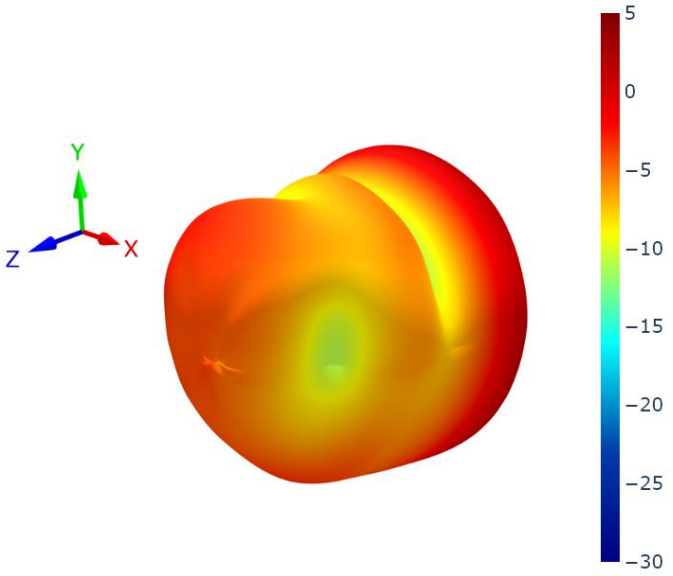
XZ Plane	YZ Plane	XY Plane
		

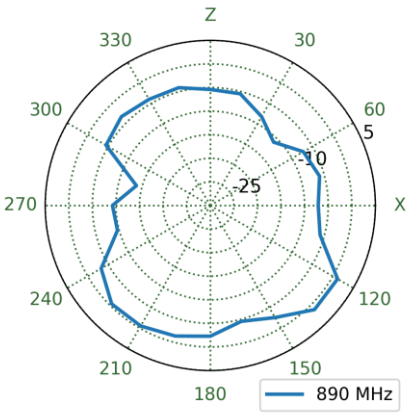
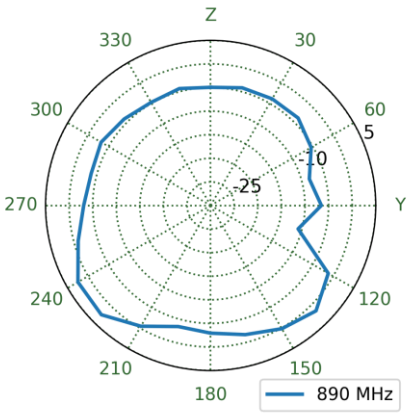
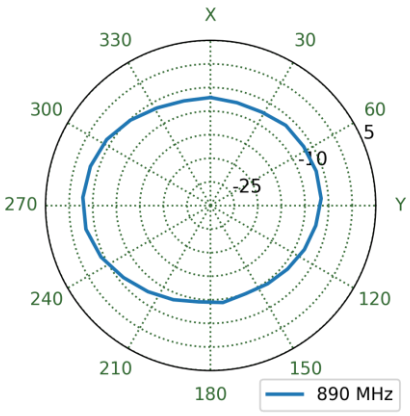
4.11 Bent on a 9x15cm Ground Plane Patterns at 890 MHz



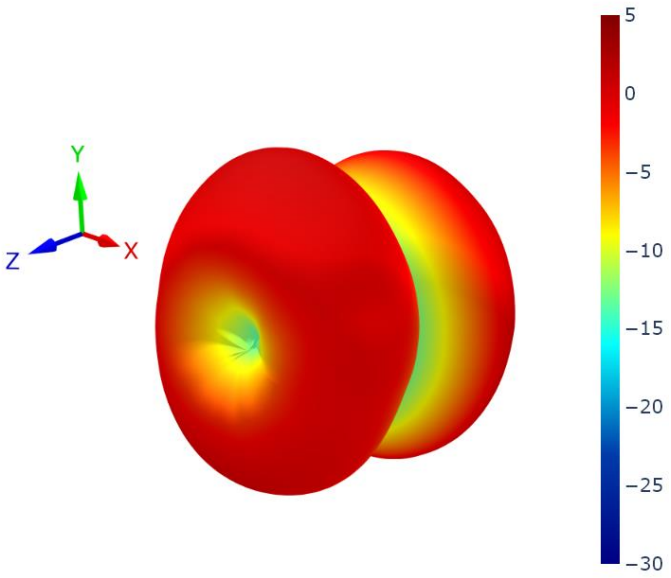
XZ Plane	YZ Plane	XY Plane
		

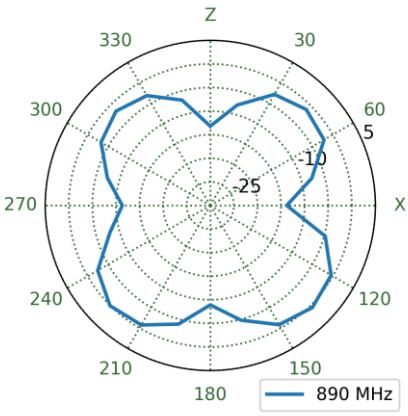
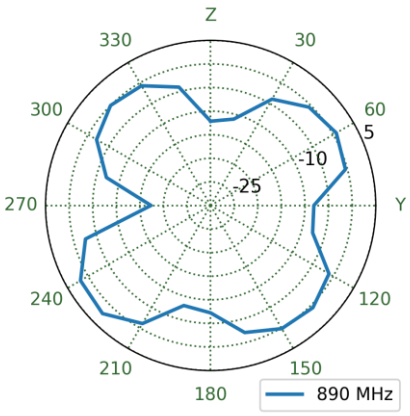
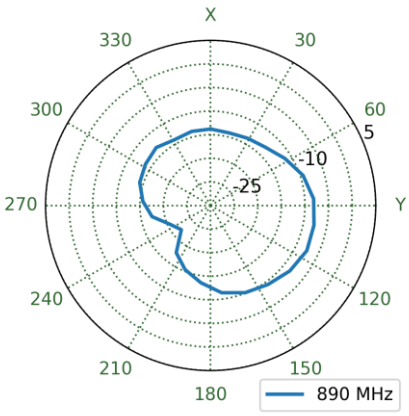
4.12 Straight in Free Space Patterns at 890 MHz



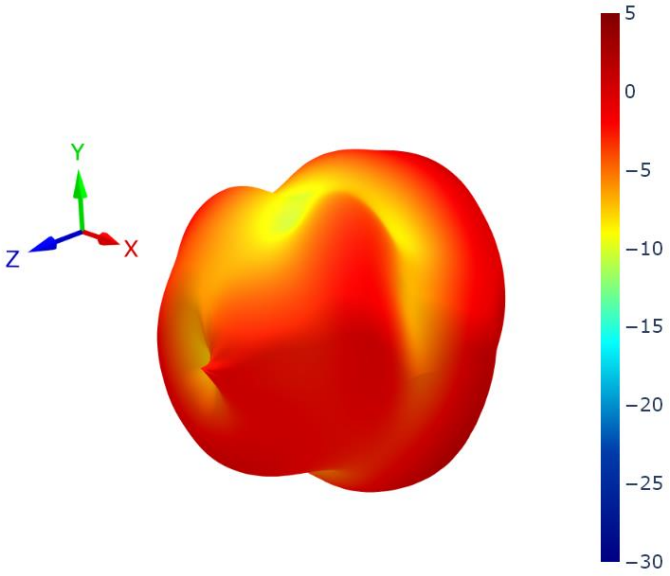
XZ Plane	YZ Plane	XY Plane
		

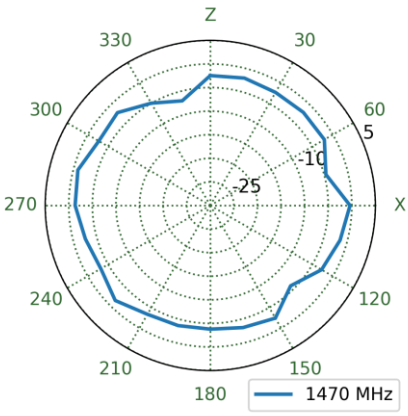
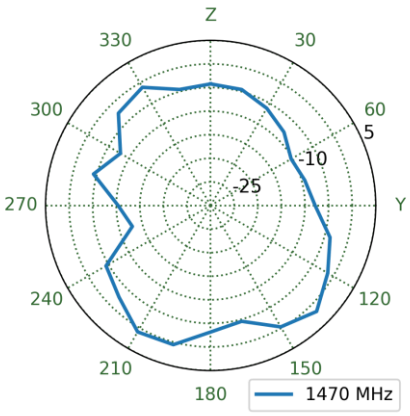
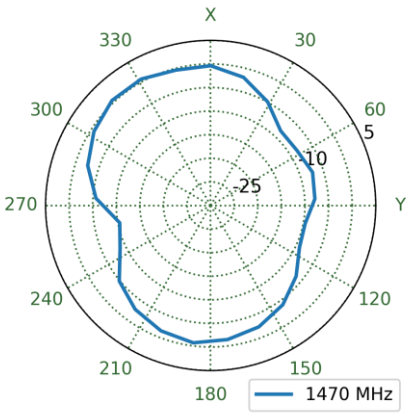
4.13 Straight on a 9x15cm Ground Plane Patterns at 890 MHz



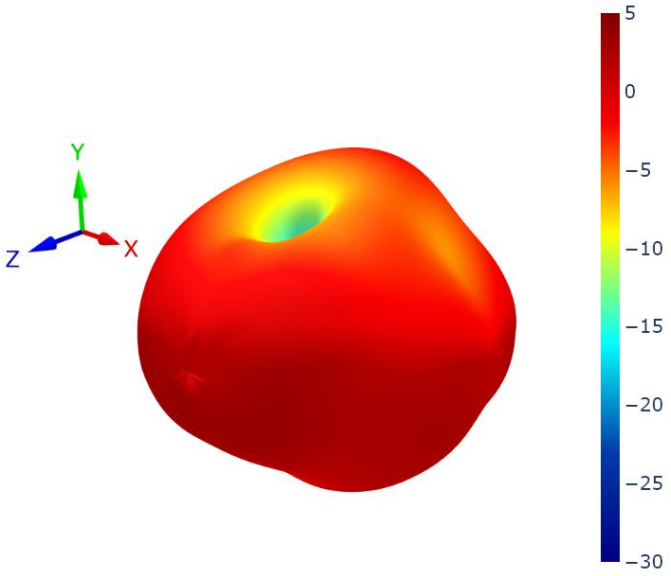
XZ Plane	YZ Plane	XY Plane
		

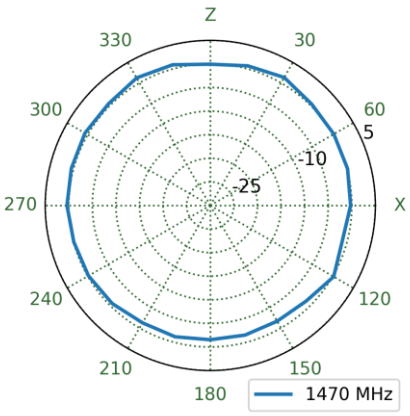
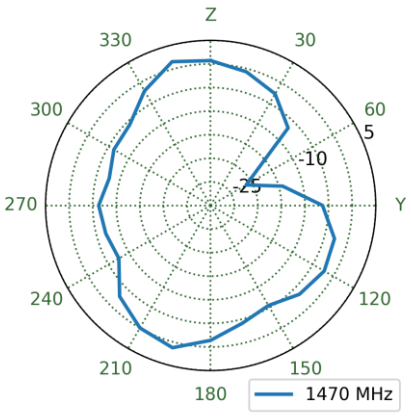
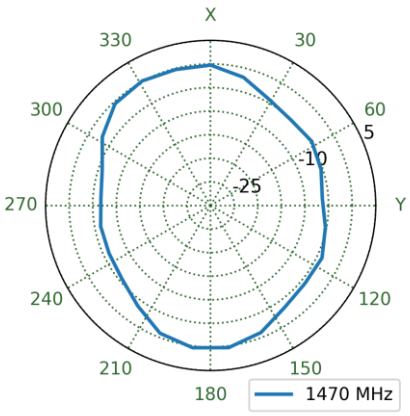
4.14 Bent in Free Space Patterns at 1470 MHz



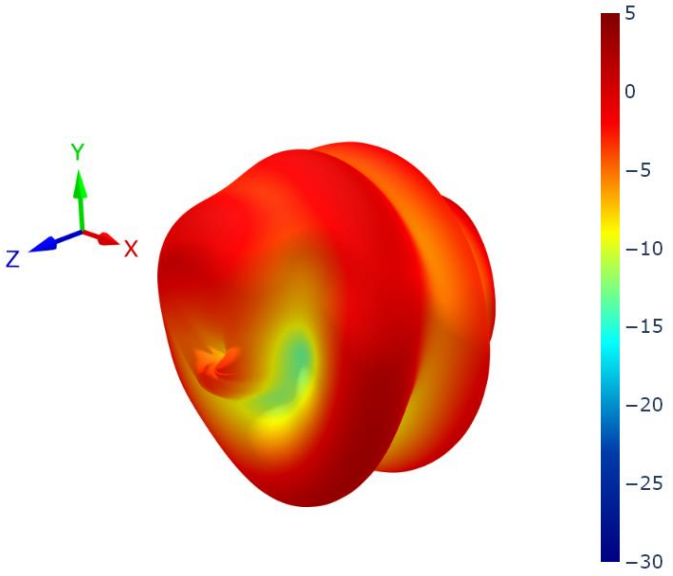
XZ Plane	YZ Plane	XY Plane
		

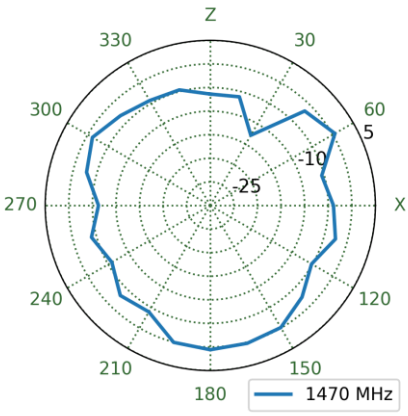
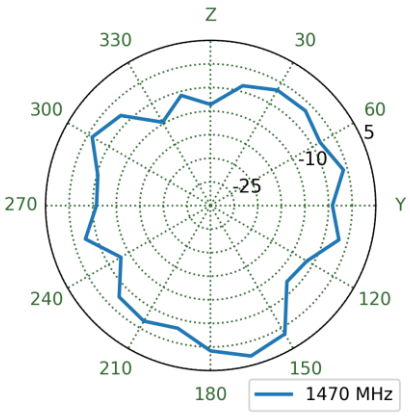
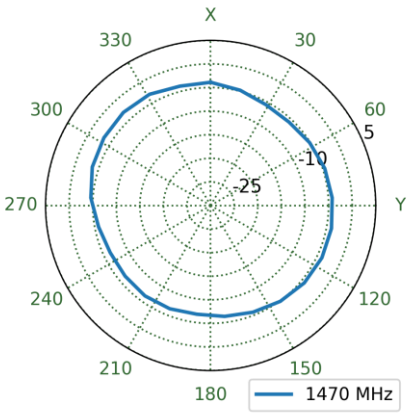
4.15 Bent on a 9x15cm Ground Plane Patterns at 1470 MHz



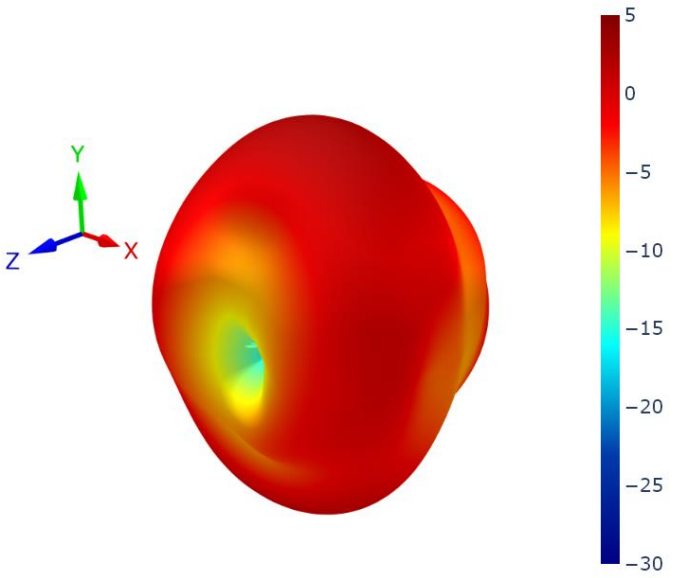
XZ Plane	YZ Plane	XY Plane
		

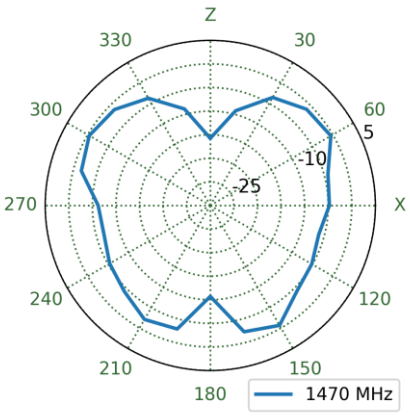
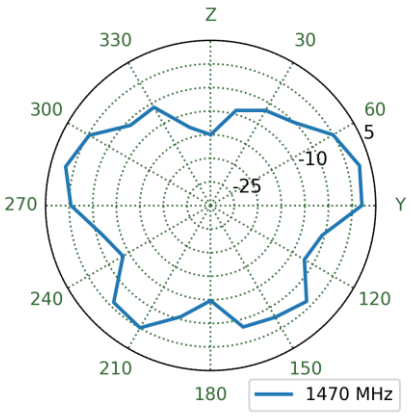
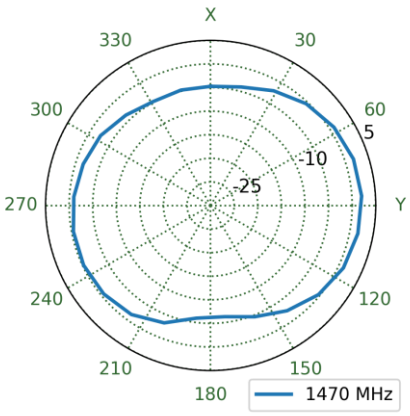
4.16 Straight in Free Space Patterns at 1470 MHz



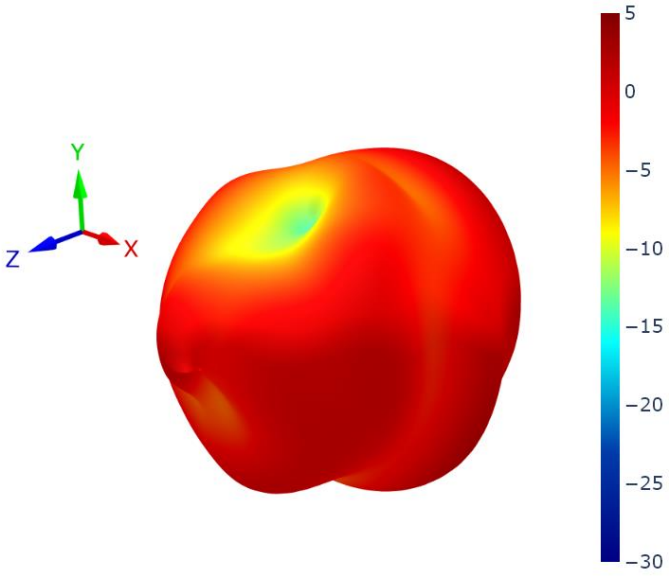
XZ Plane	YZ Plane	XY Plane
		

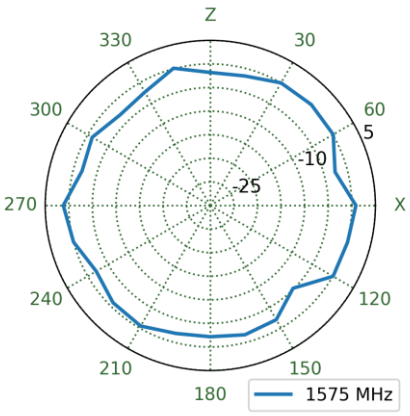
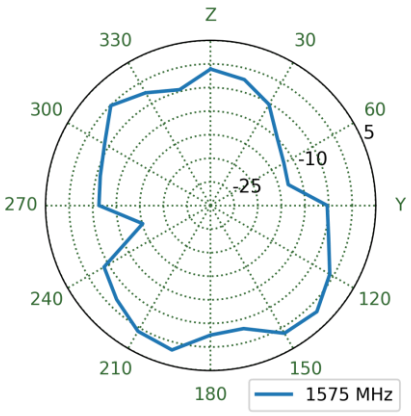
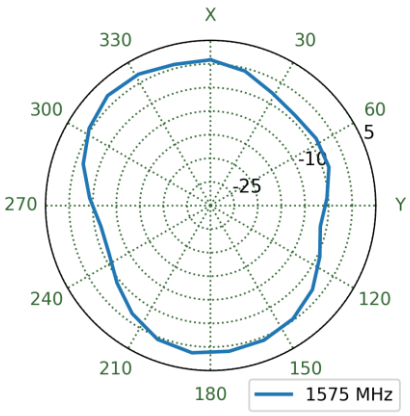
4.17 Straight on a 9x15cm Ground Plane Patterns at 1470 MHz



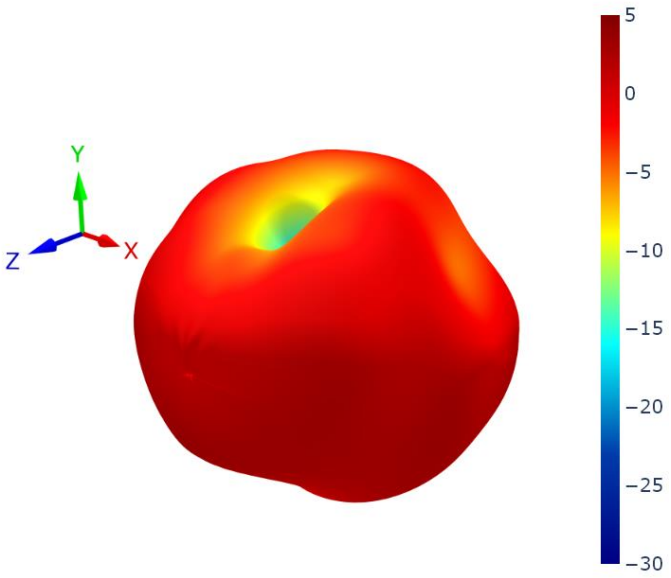
XZ Plane	YZ Plane	XY Plane
		

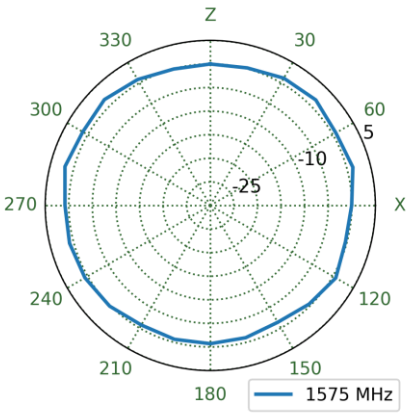
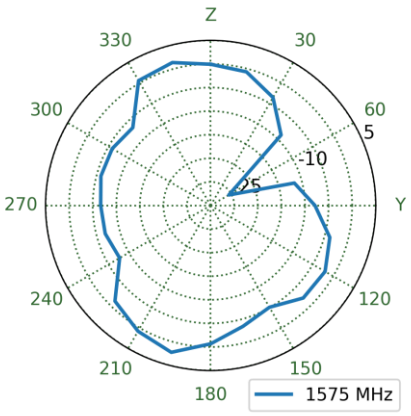
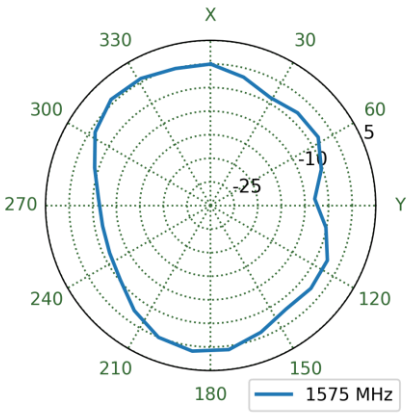
4.18 Bent in Free Space Patterns at 1575 MHz



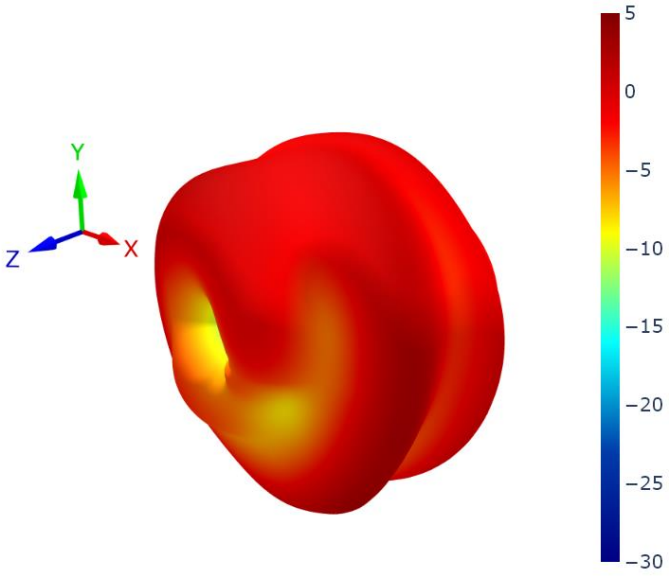
XZ Plane	YZ Plane	XY Plane
		

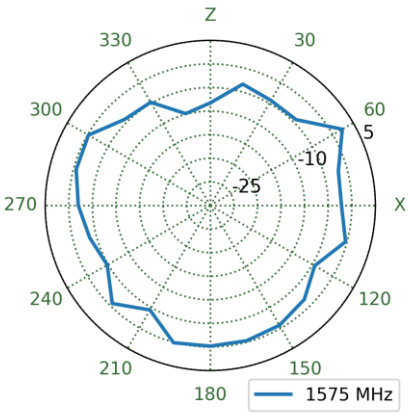
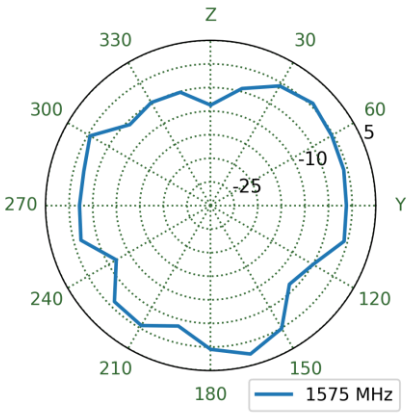
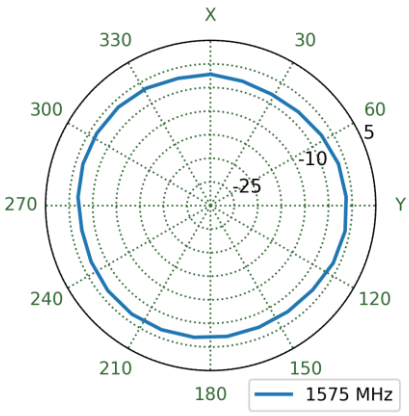
4.19 Bent on a 9x15cm Ground Plane Patterns at 1575 MHz



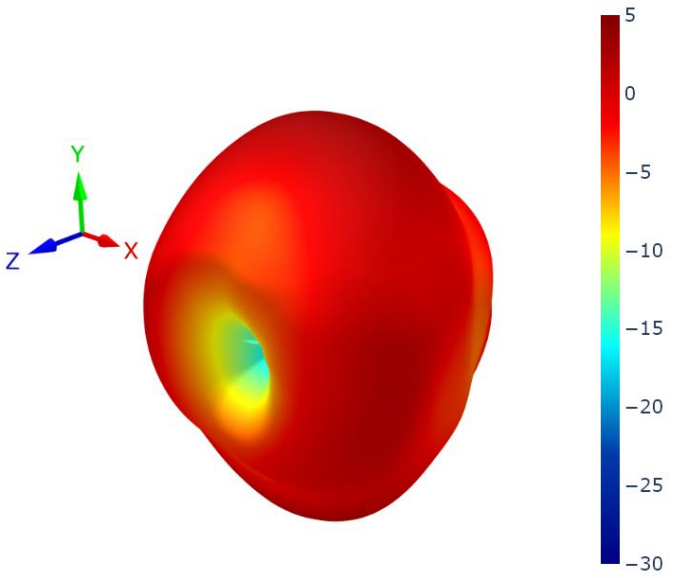
XZ Plane	YZ Plane	XY Plane
		

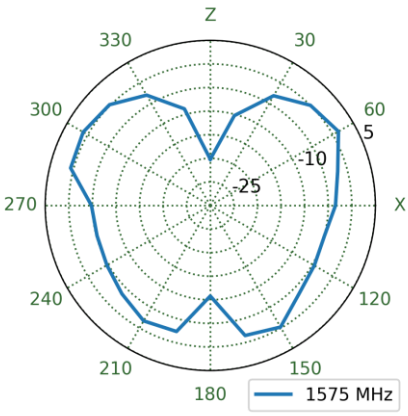
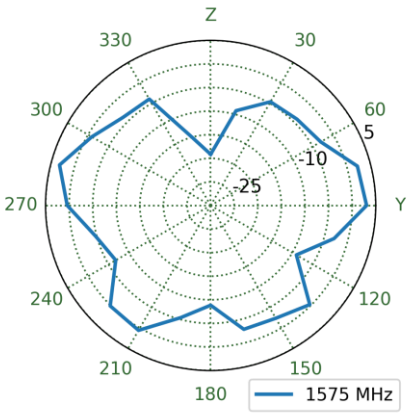
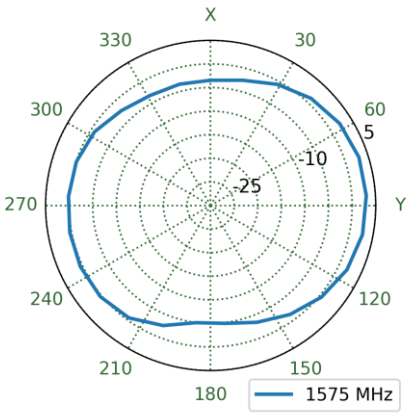
4.20 Straight in Free Space Patterns at 1575 MHz



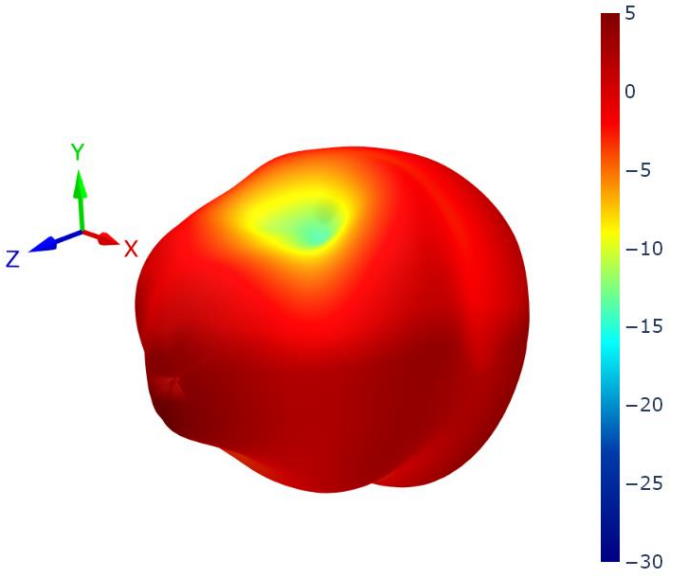
XZ Plane	YZ Plane	XY Plane
		

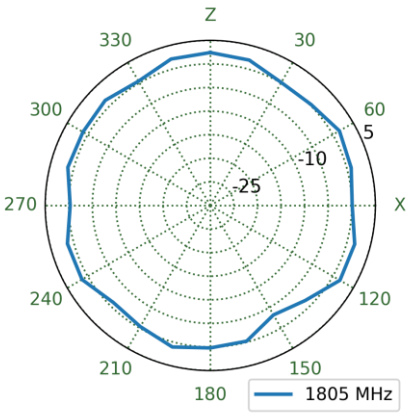
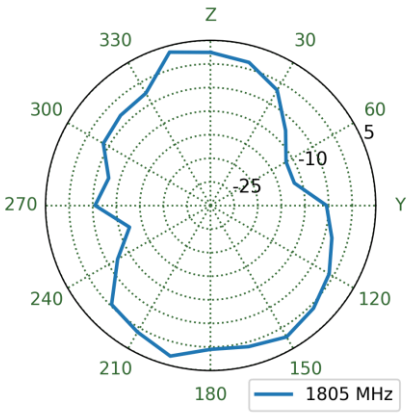
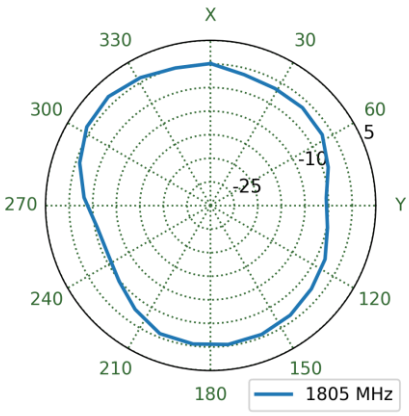
4.21 Straight on a 9x15cm Ground Plane Patterns at 1575 MHz



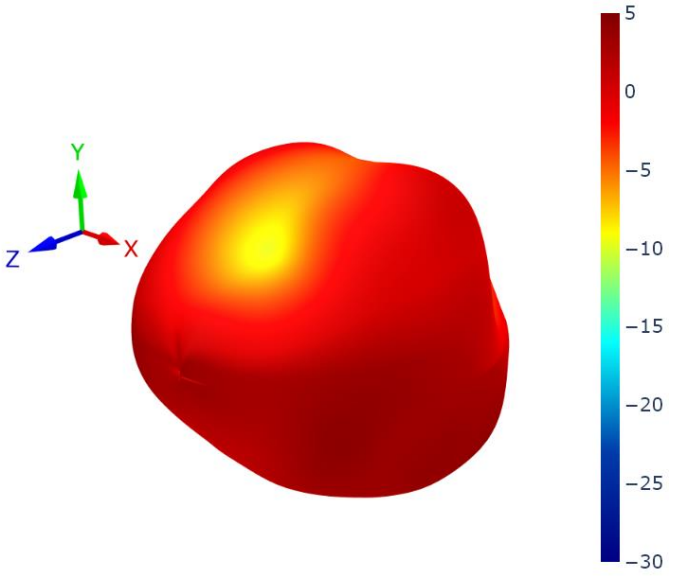
XZ Plane	YZ Plane	XY Plane
		

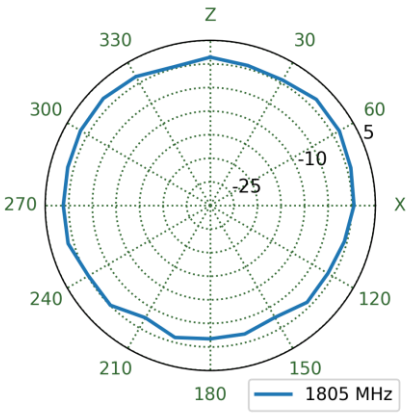
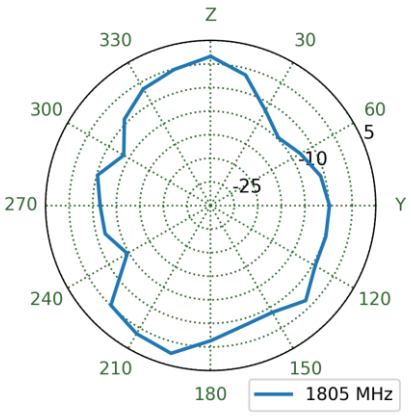
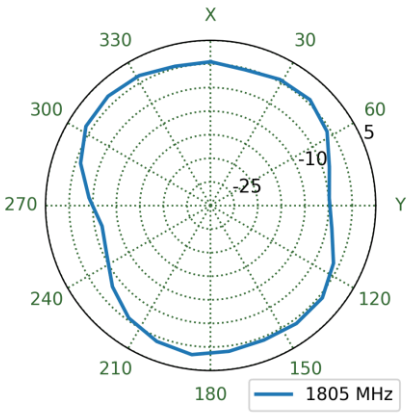
4.22 Bent in Free Space Patterns at 1805 MHz



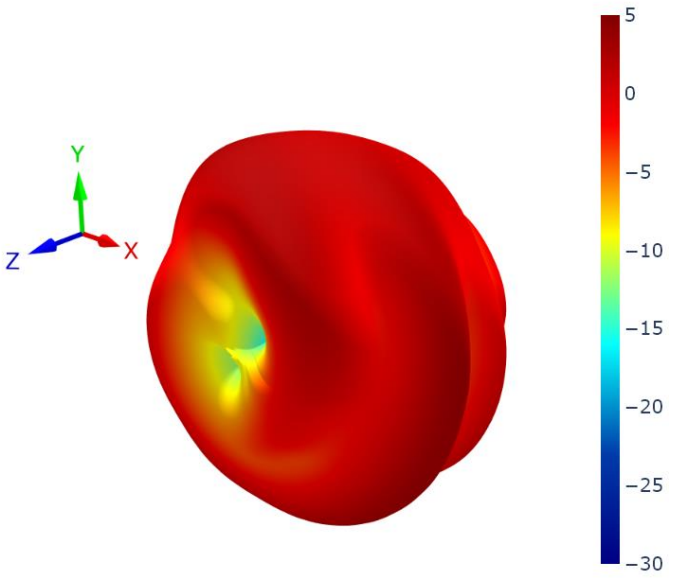
XZ Plane	YZ Plane	XY Plane
		

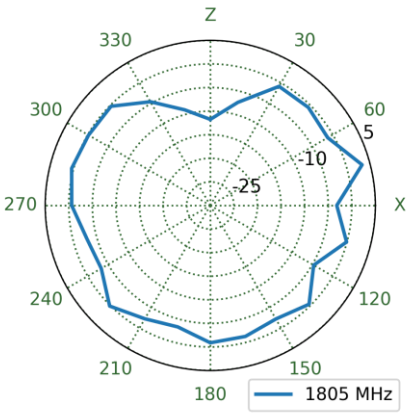
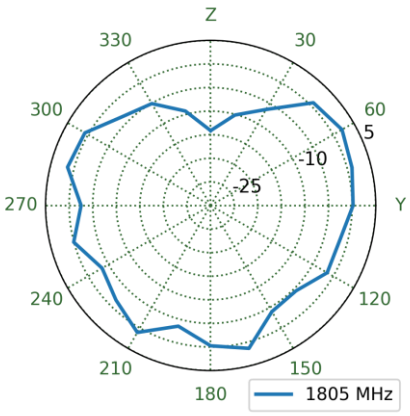
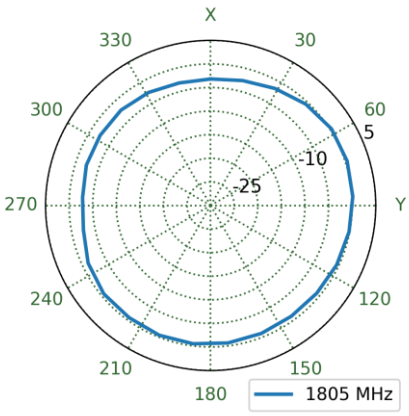
4.23 Bent on a 9x15cm Ground Plane Patterns at 1805 MHz



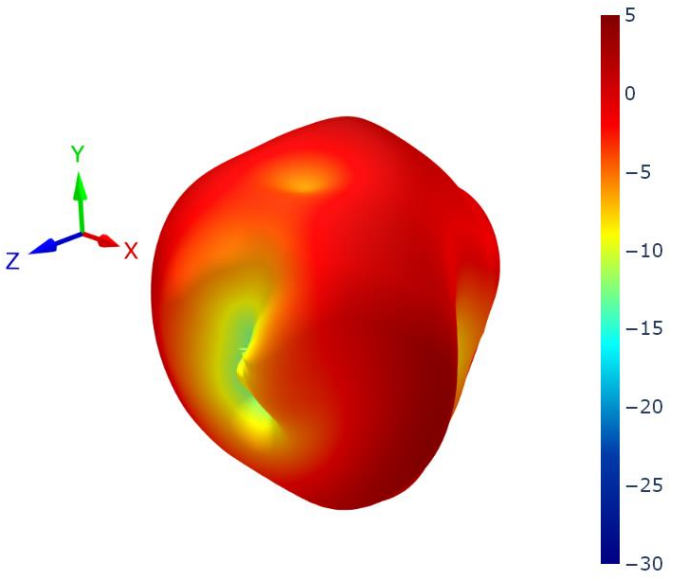
XZ Plane	YZ Plane	XY Plane
		

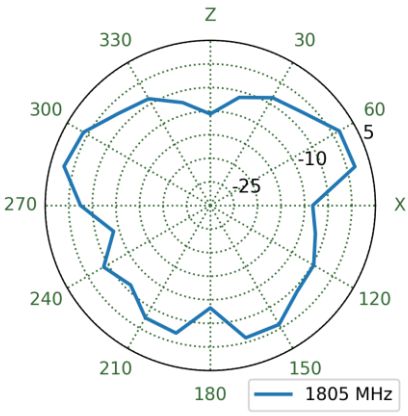
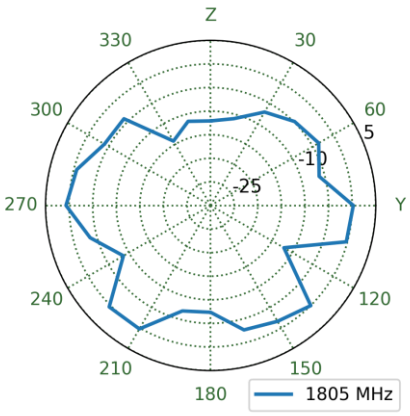
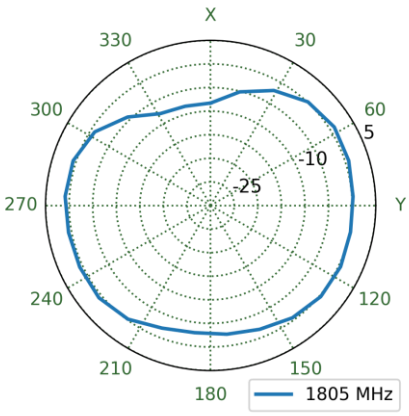
4.24 Straight in Free Space Patterns at 1805 MHz



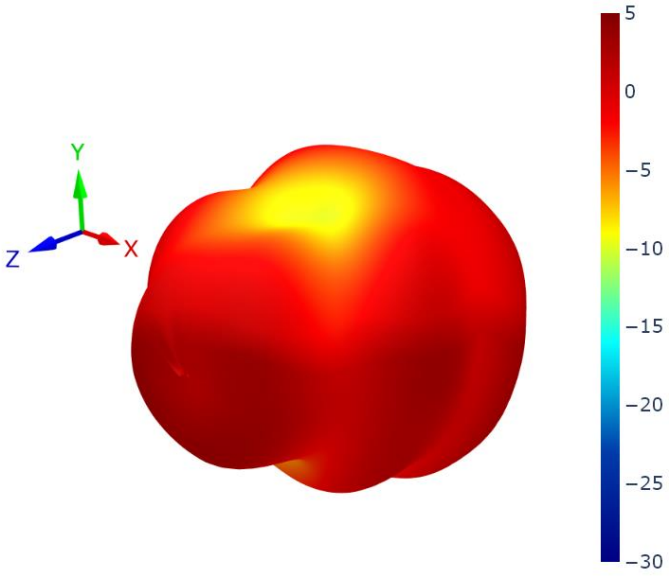
XZ Plane	YZ Plane	XY Plane
		

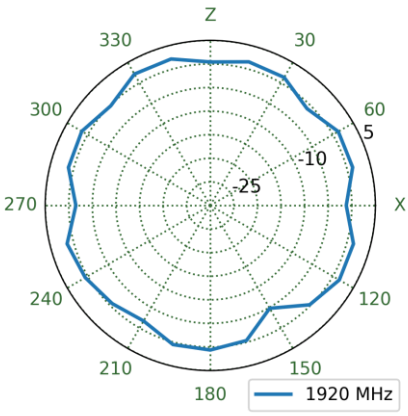
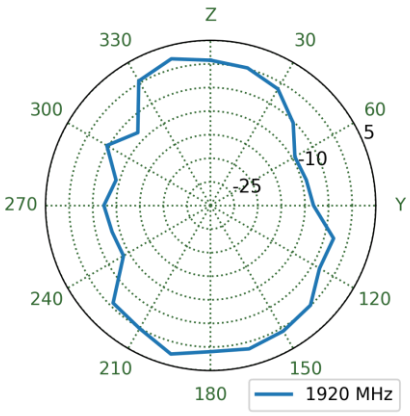
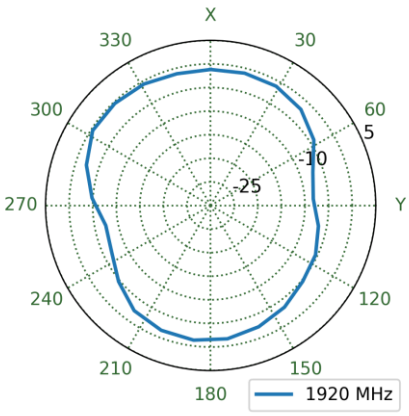
4.25 Straight on a 9x15cm Ground Plane Patterns at 1805 MHz



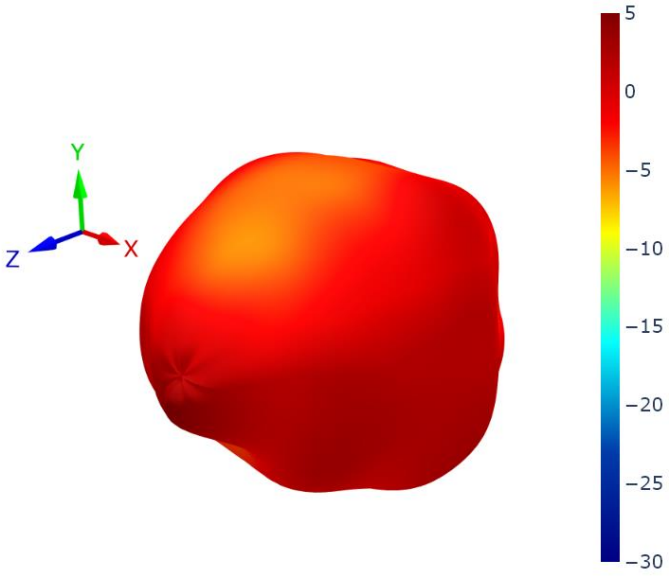
XZ Plane	YZ Plane	XY Plane
		

4.26 Bent in Free Space Patterns at 1920 MHz

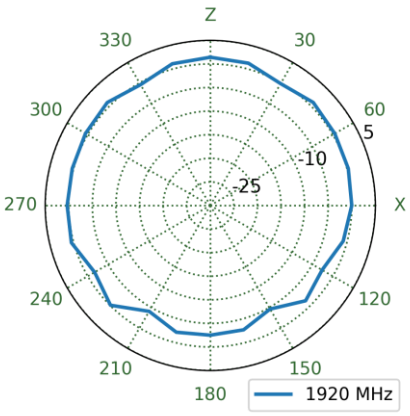


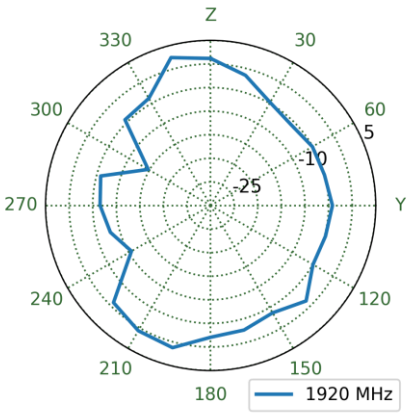
XZ Plane	YZ Plane	XY Plane
		

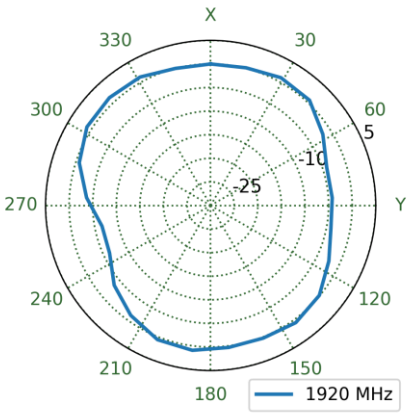
4.27 Bent on a 9x15cm Ground Plane Patterns at 1920 MHz



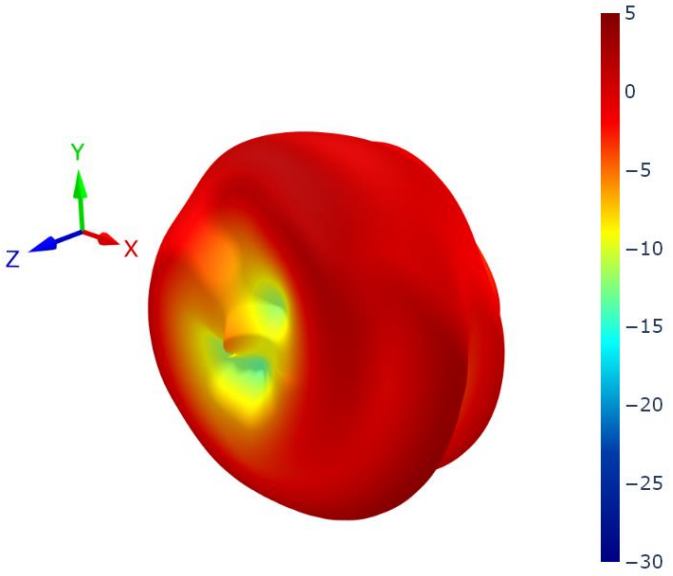
XZ Plane	YZ Plane	XY Plane

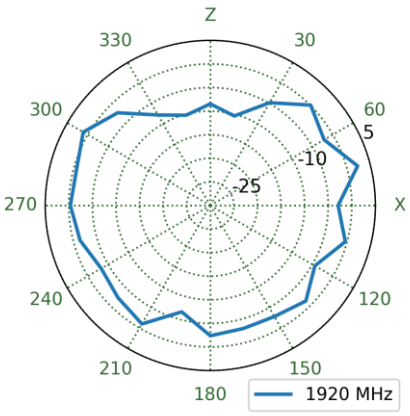
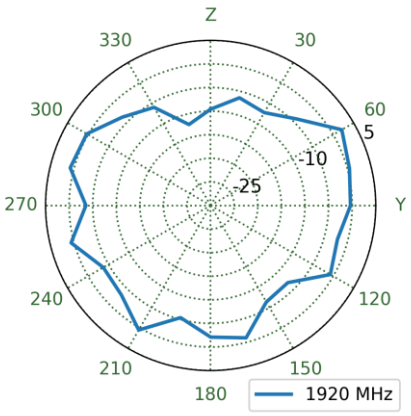
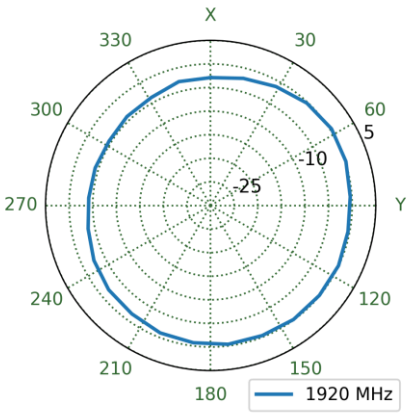




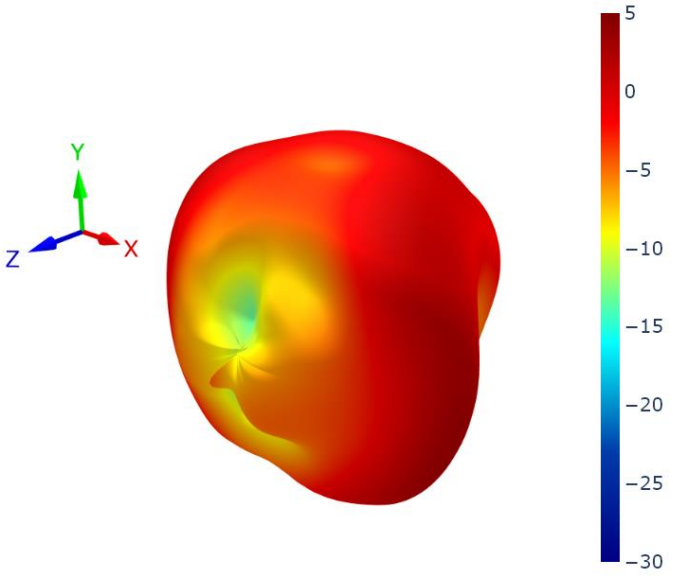


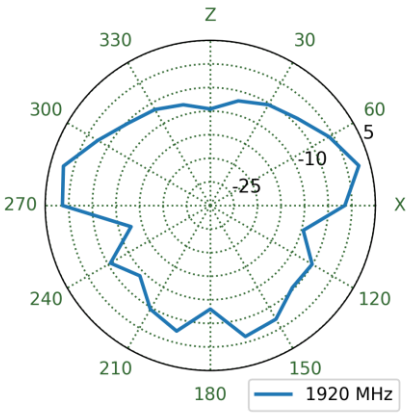
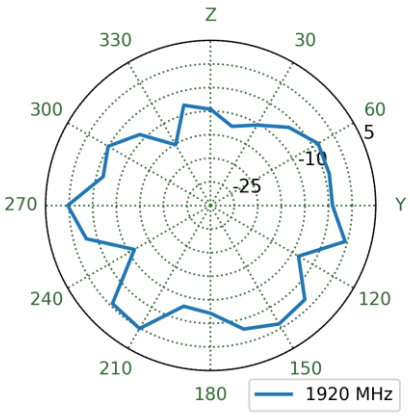
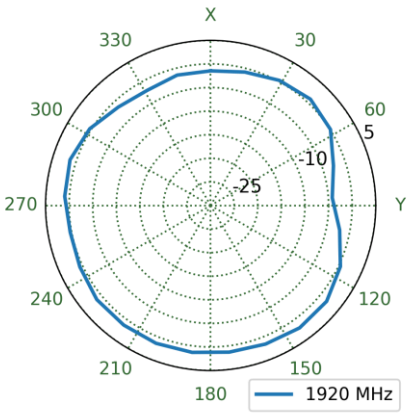
4.28 Straight in Free Space Patterns at 1920 MHz



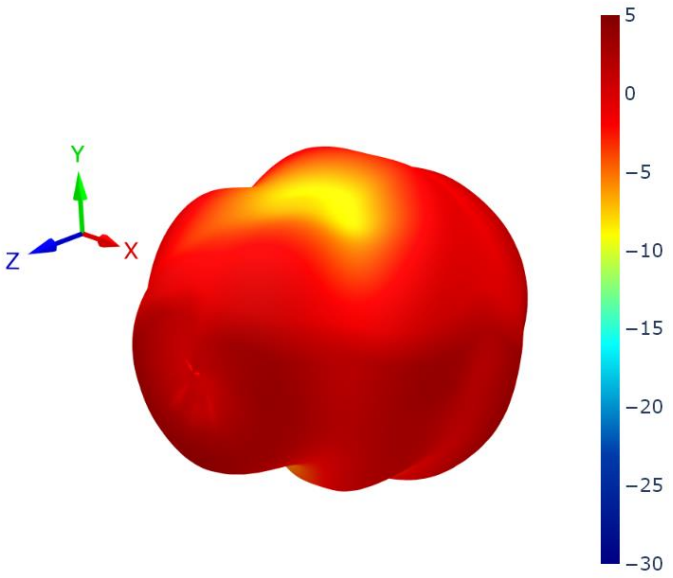
XZ Plane	YZ Plane	XY Plane
		

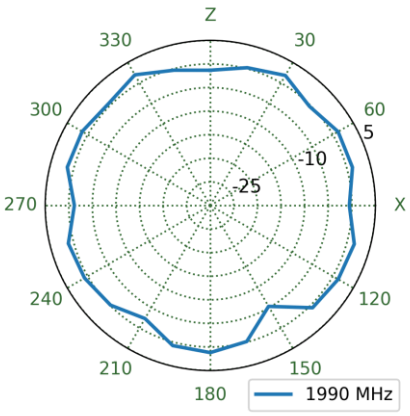
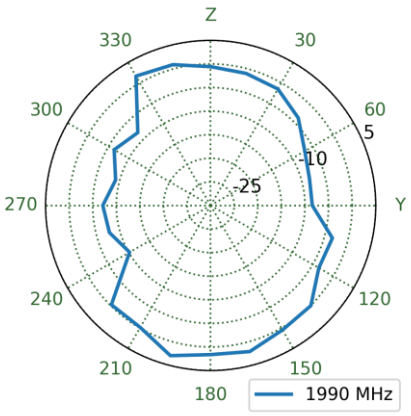
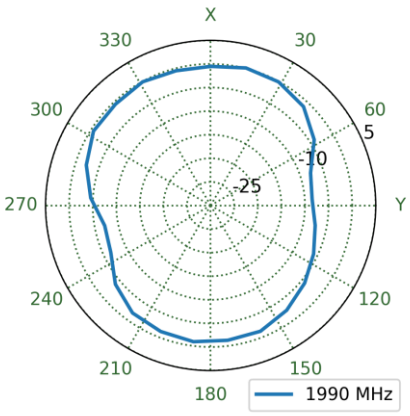
4.29 Straight on a 9x15cm Ground Plane Patterns at 1920 MHz



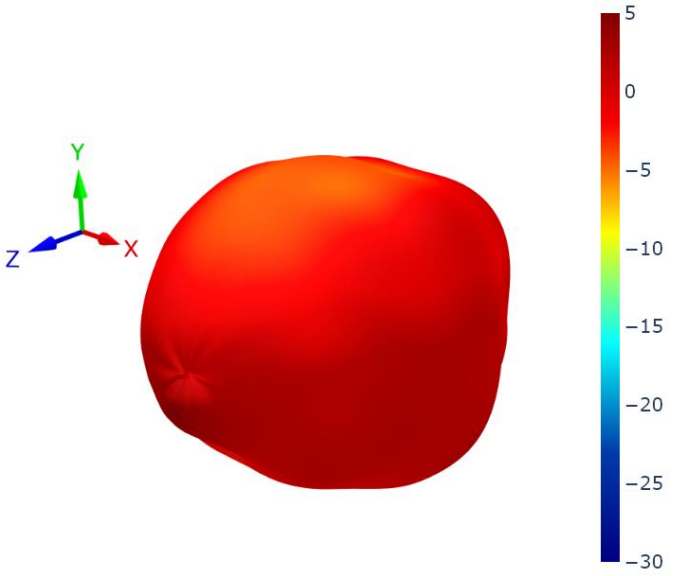
XZ Plane	YZ Plane	XY Plane
		

4.30 Bent in Free Space Patterns at 1990 MHz

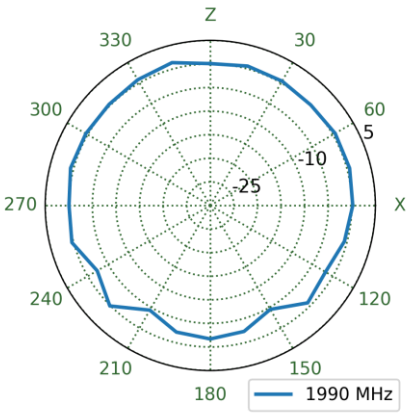


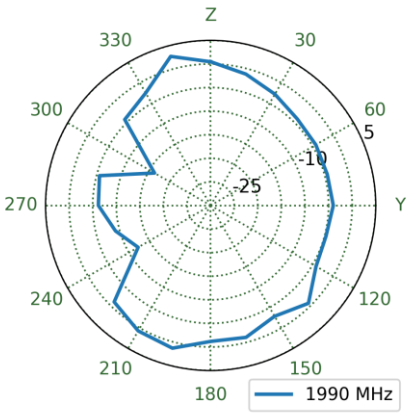
XZ Plane	YZ Plane	XY Plane
		

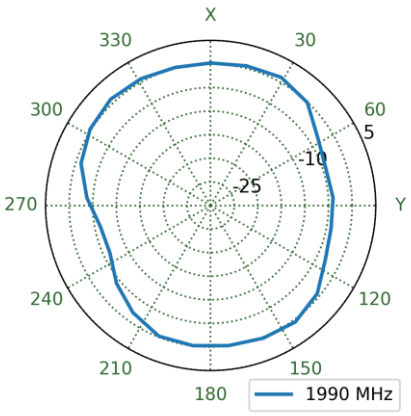
4.31 Bent on a 9x15cm Ground Plane Patterns at 1990 MHz



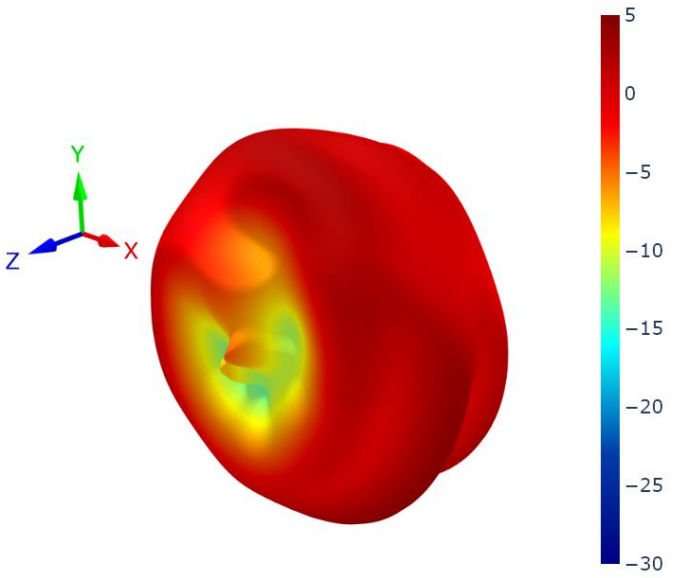
XZ Plane	YZ Plane	XY Plane

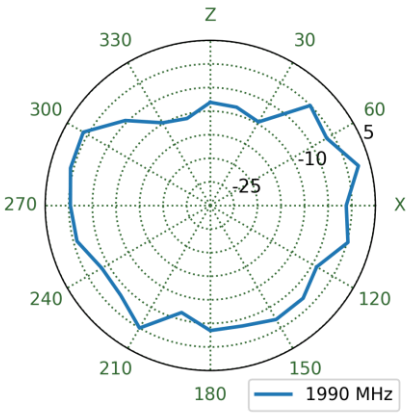
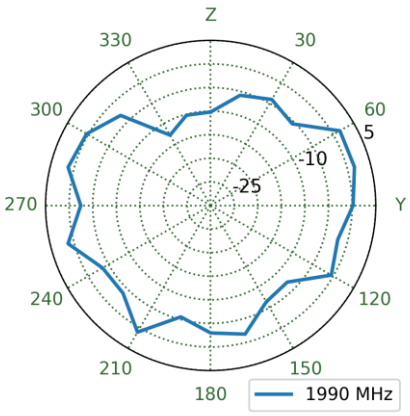
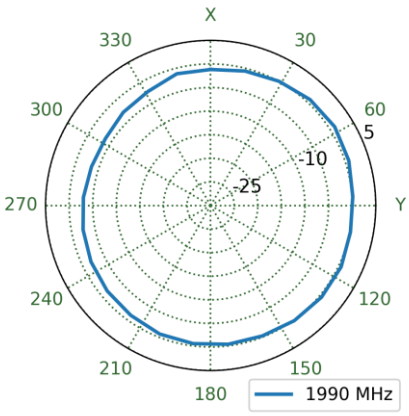




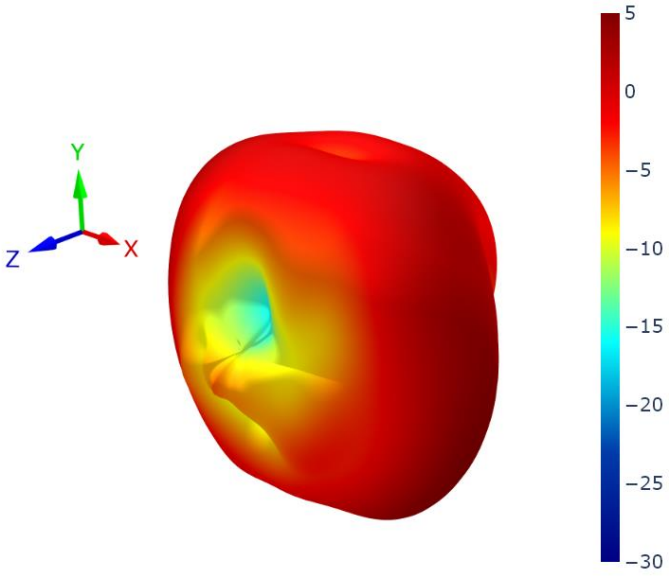


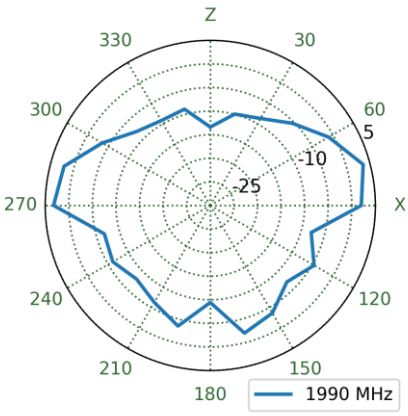
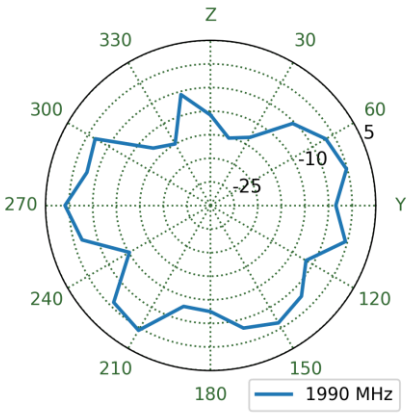
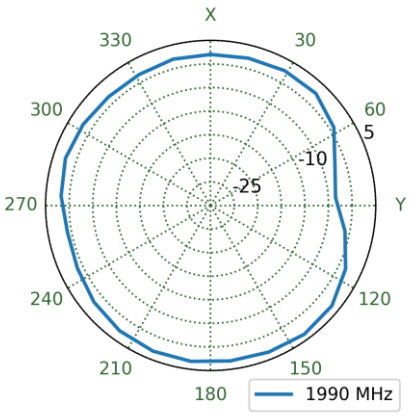
4.32 Straight in Free Space Patterns at 1990 MHz



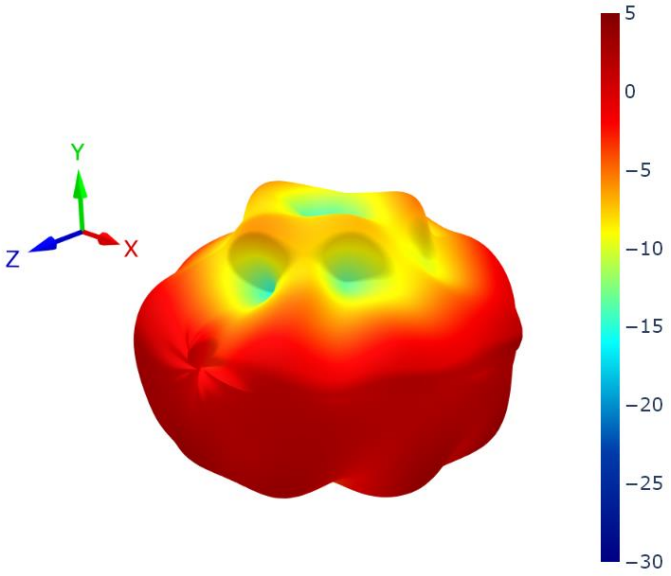
XZ Plane	YZ Plane	XY Plane
		

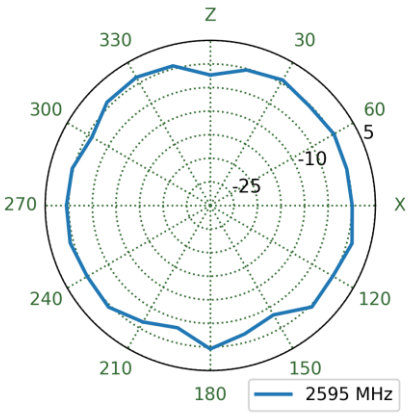
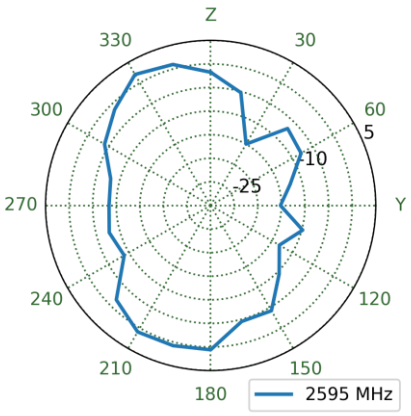
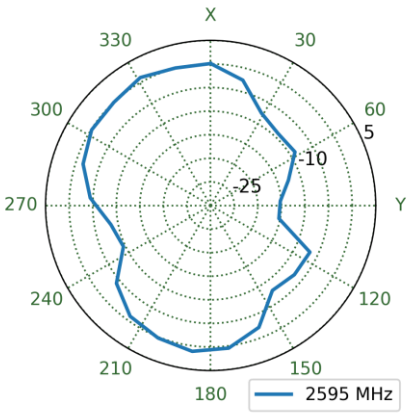
4.33 Straight on a 9x15cm Ground Plane Patterns at 1990 MHz



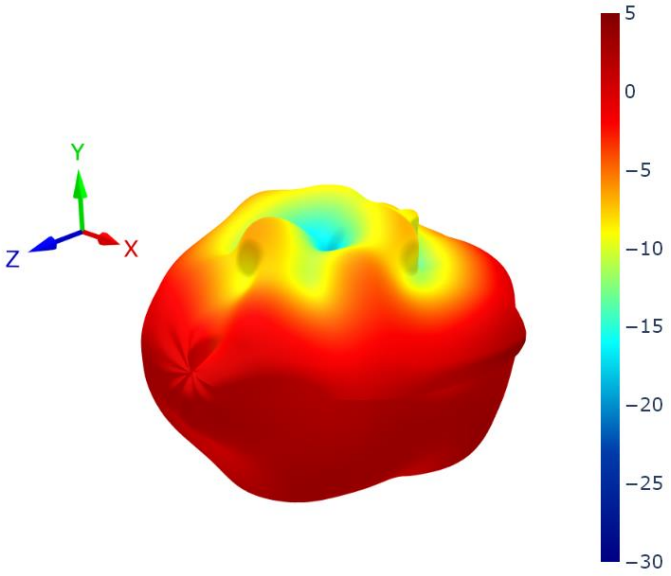
XZ Plane	YZ Plane	XY Plane
		

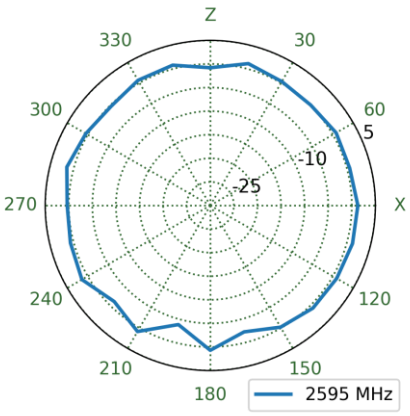
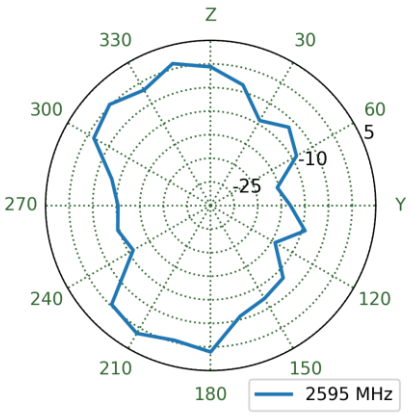
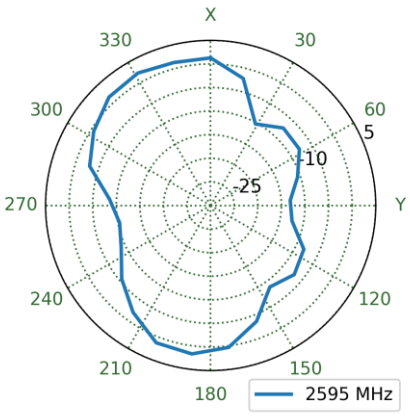
4.34 Bent in Free Space Patterns at 2595 MHz



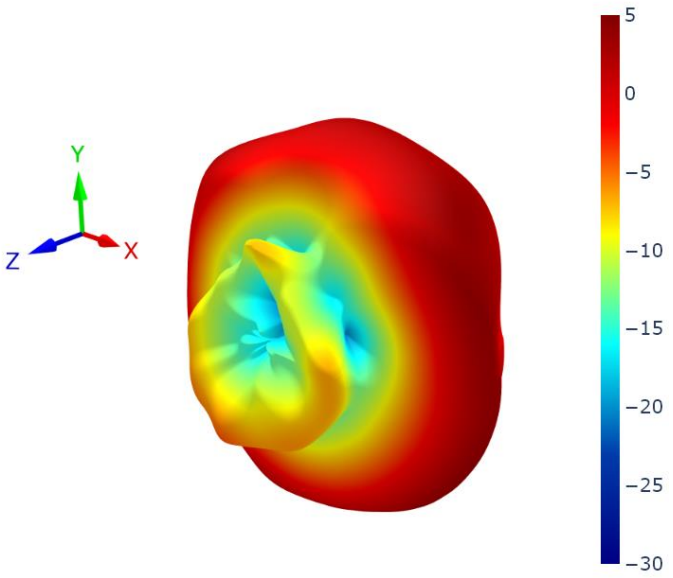
XZ Plane	YZ Plane	XY Plane
		

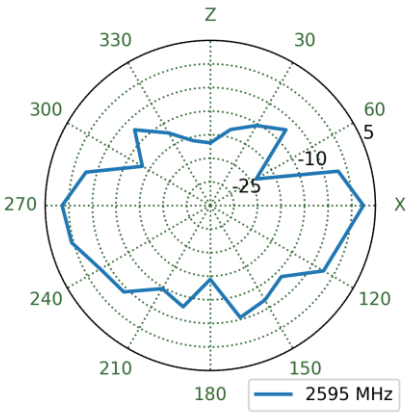
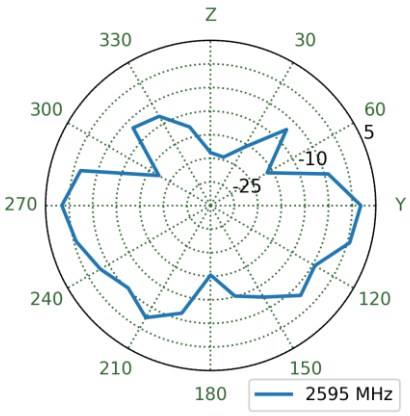
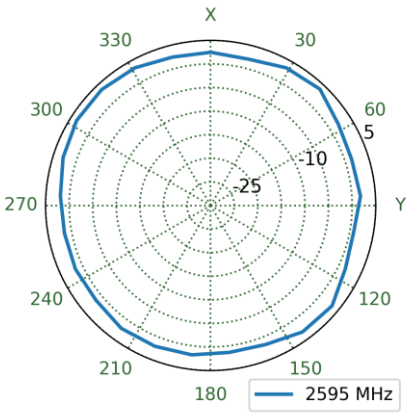
4.35 Bent on a 9x15cm Ground Plane Patterns at 2595 MHz



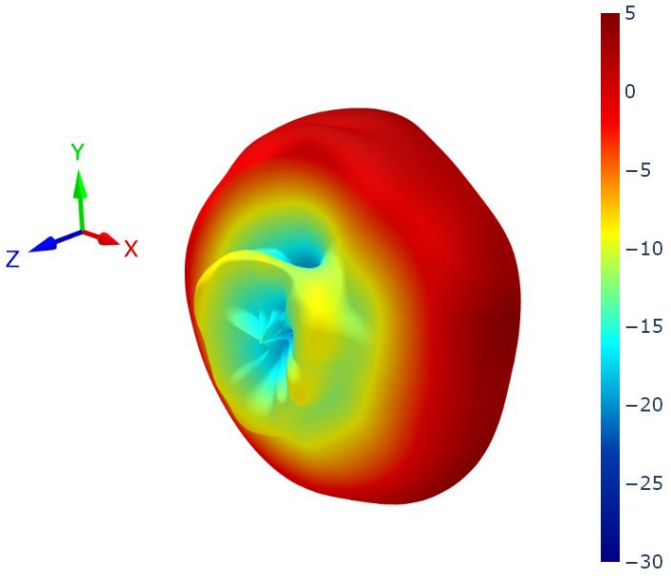
XZ Plane	YZ Plane	XY Plane
		

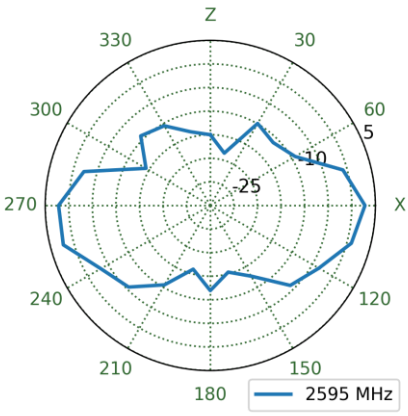
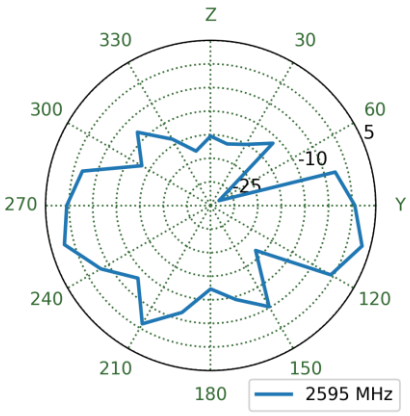
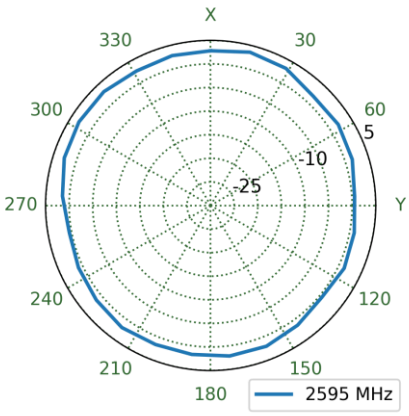
4.36 Straight in Free Space Patterns at 2595 MHz



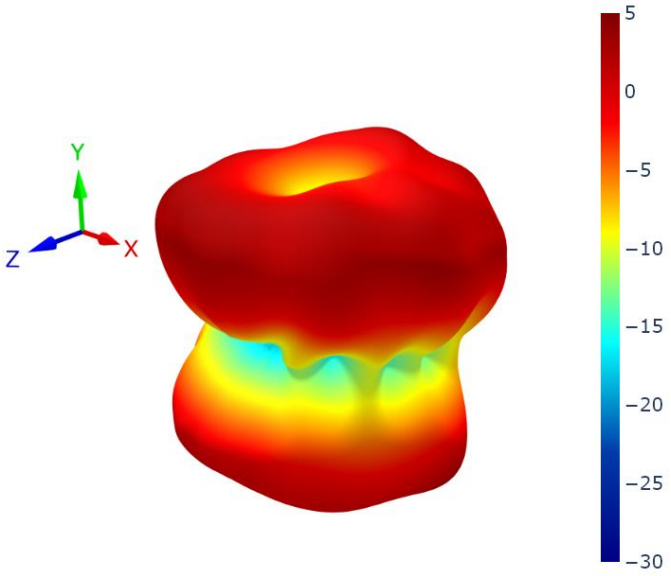
XZ Plane	YZ Plane	XY Plane
		

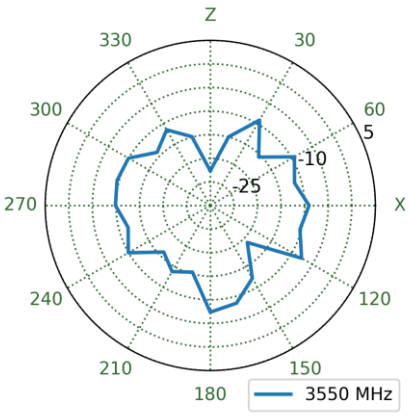
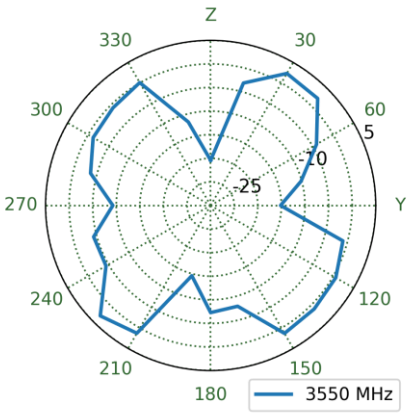
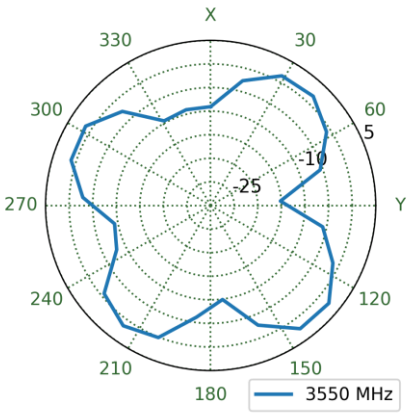
4.37 Straight on a 9x15cm Ground Plane Patterns at 2595 MHz



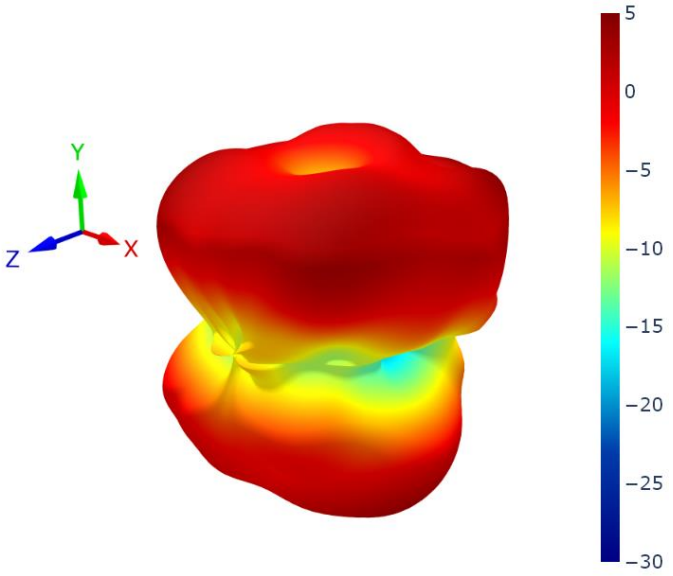
XZ Plane	YZ Plane	XY Plane
		

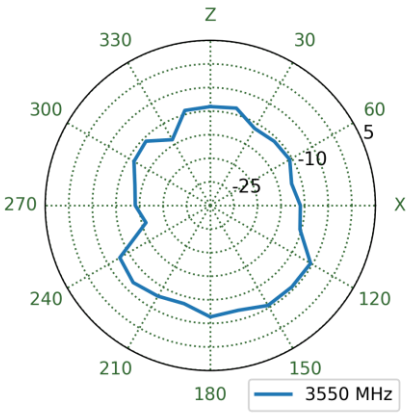
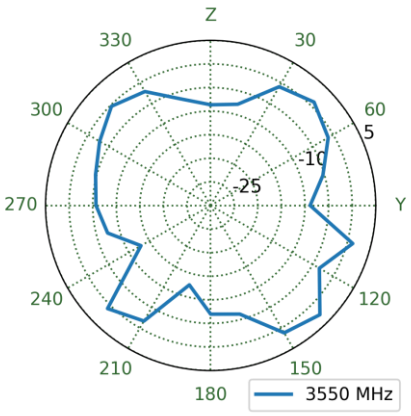
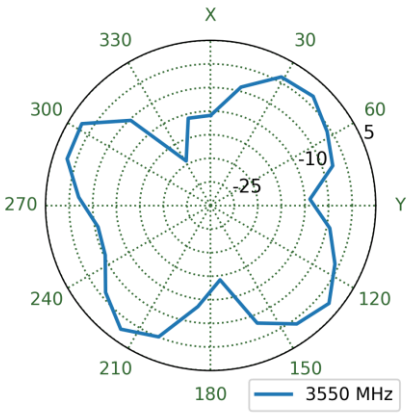
4.38 Bent in Free Space Patterns at 3550 MHz



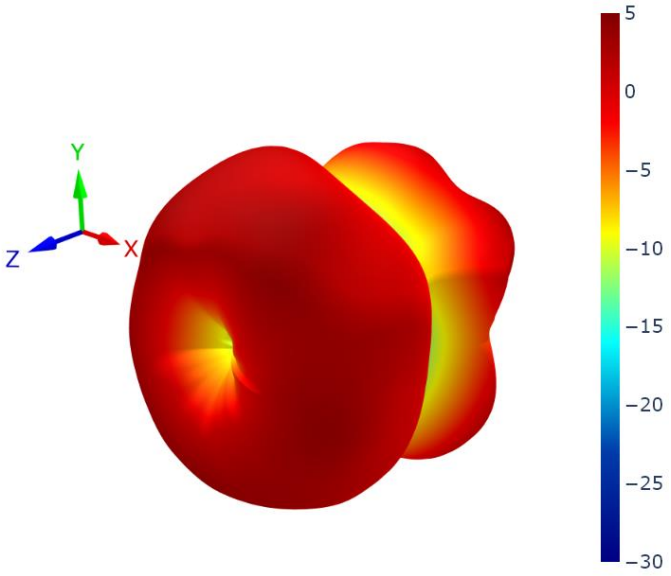
XZ Plane	YZ Plane	XY Plane
		

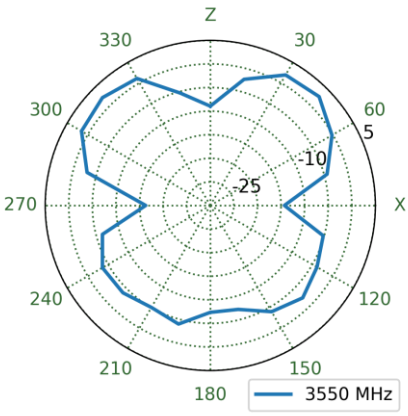
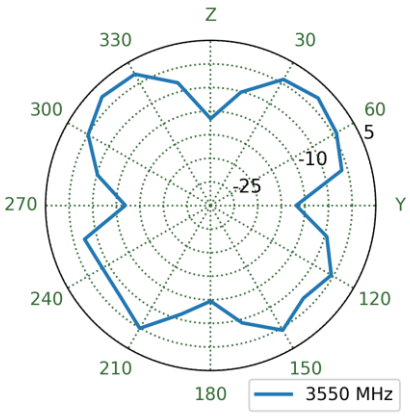
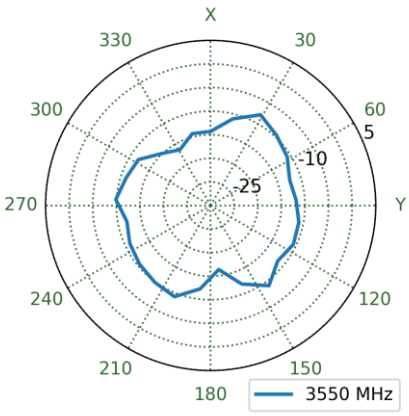
4.39 Bent on a 9x15cm Ground Plane Patterns at 3550 MHz



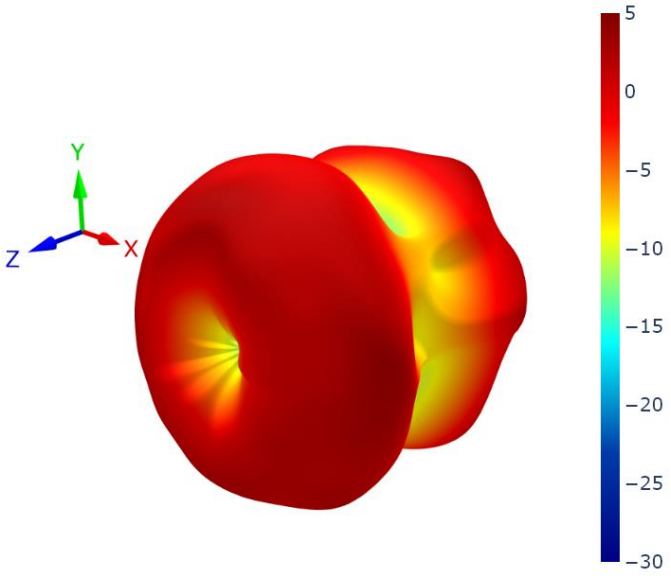
XZ Plane	YZ Plane	XY Plane
		

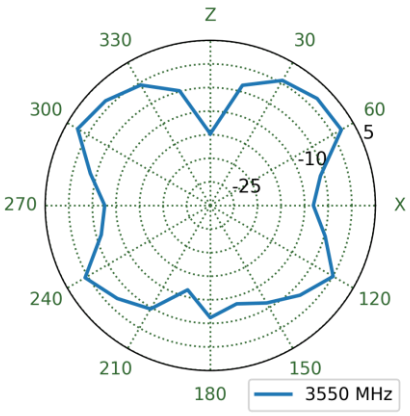
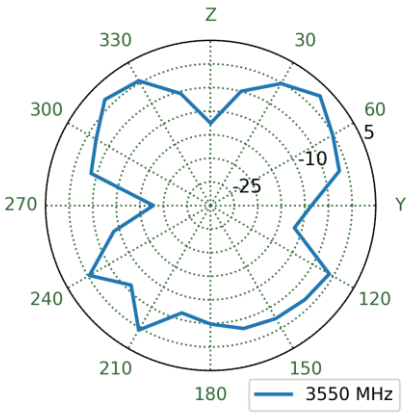
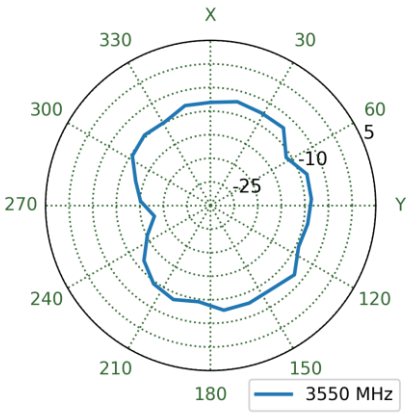
4.40 Straight in Free Space Patterns at 3550 MHz



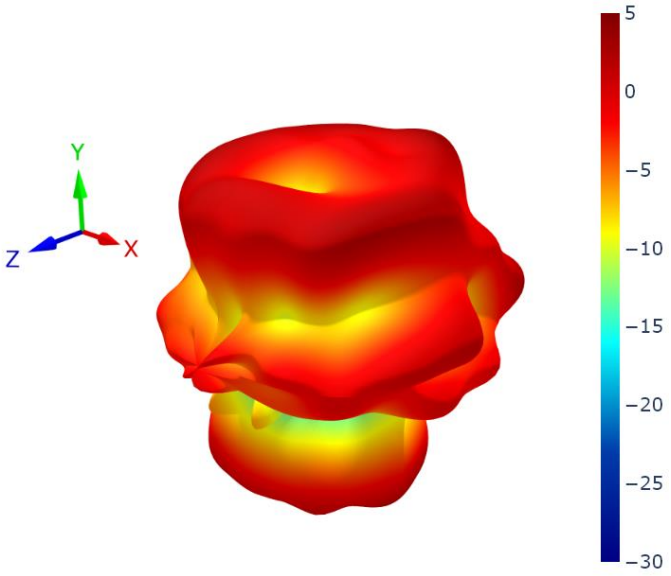
XZ Plane	YZ Plane	XY Plane
		

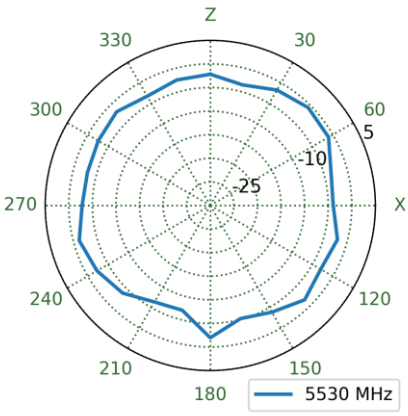
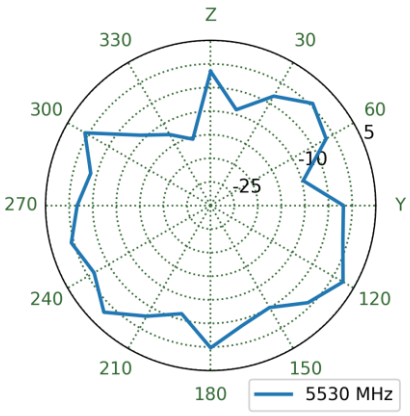
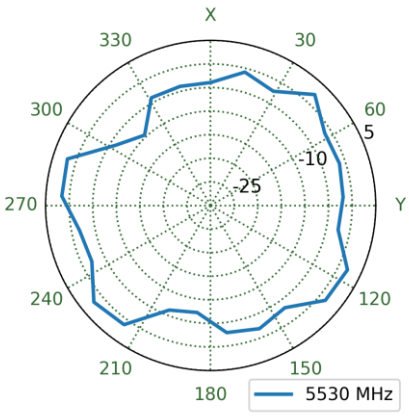
4.41 Straight on a 9x15cm Ground Plane Patterns at 3550 MHz



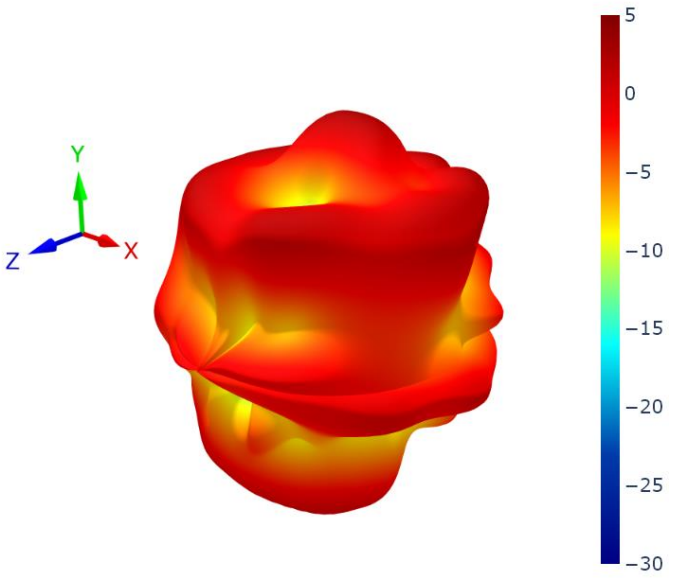
XZ Plane	YZ Plane	XY Plane
		

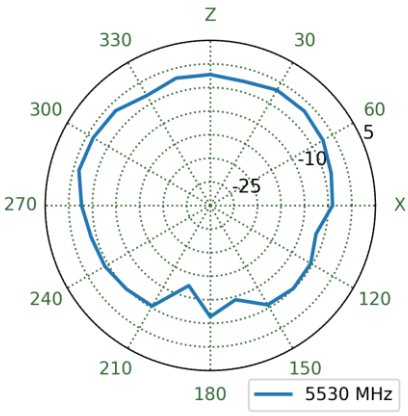
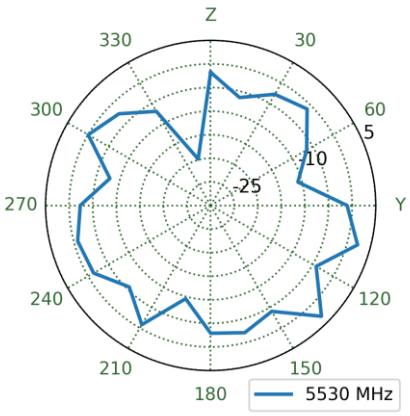
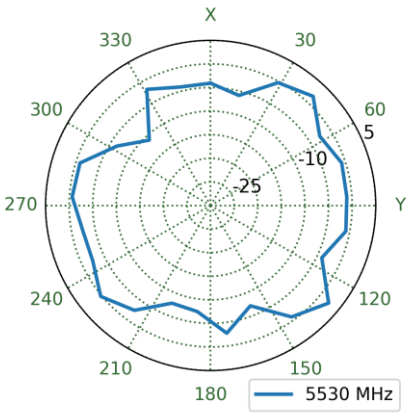
4.42 Bent in Free Space Patterns at 5530 MHz



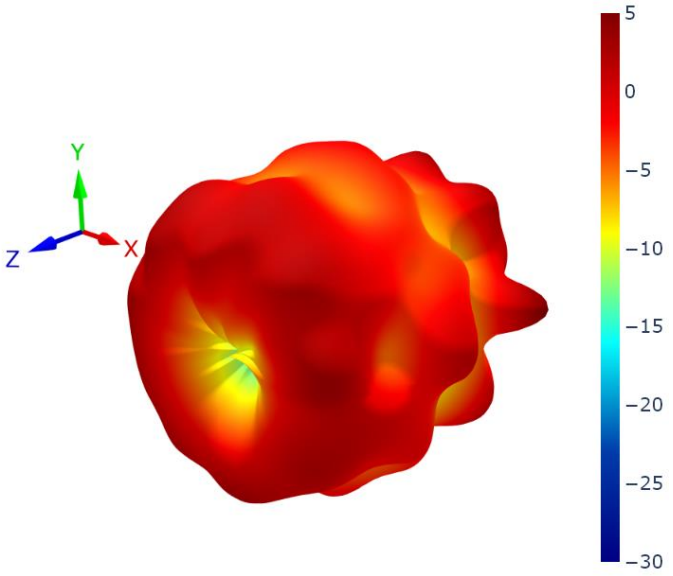
XZ Plane	YZ Plane	XY Plane
		

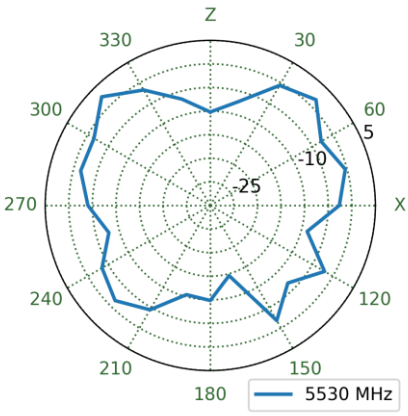
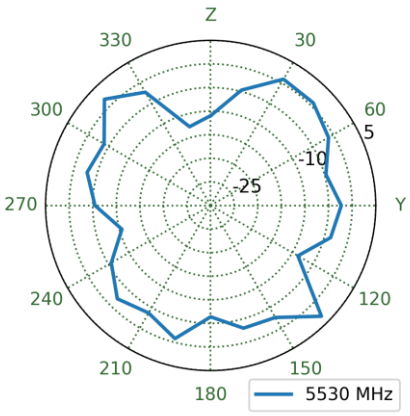
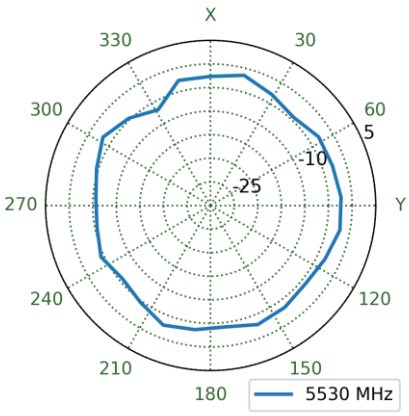
4.43 Bent on a 9x15cm Ground Plane Patterns at 5530 MHz



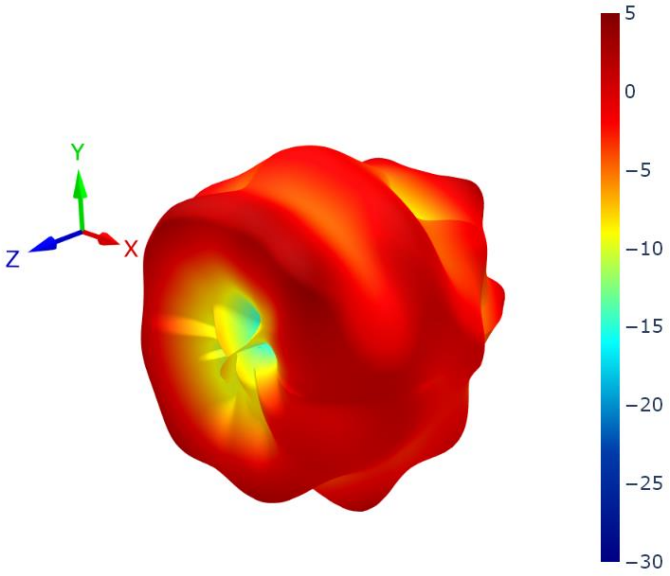
XZ Plane	YZ Plane	XY Plane
		

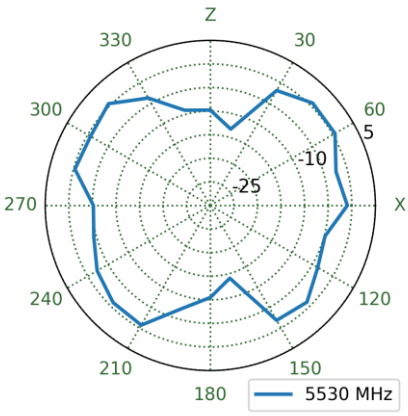
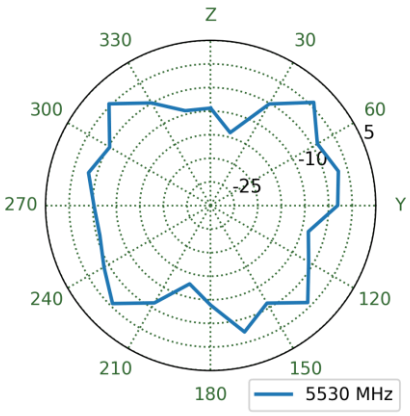
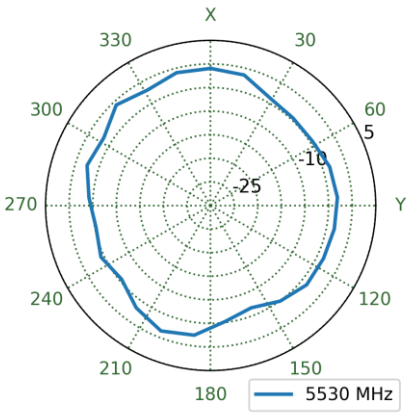
4.44 Straight in Free Space Patterns at 5530 MHz



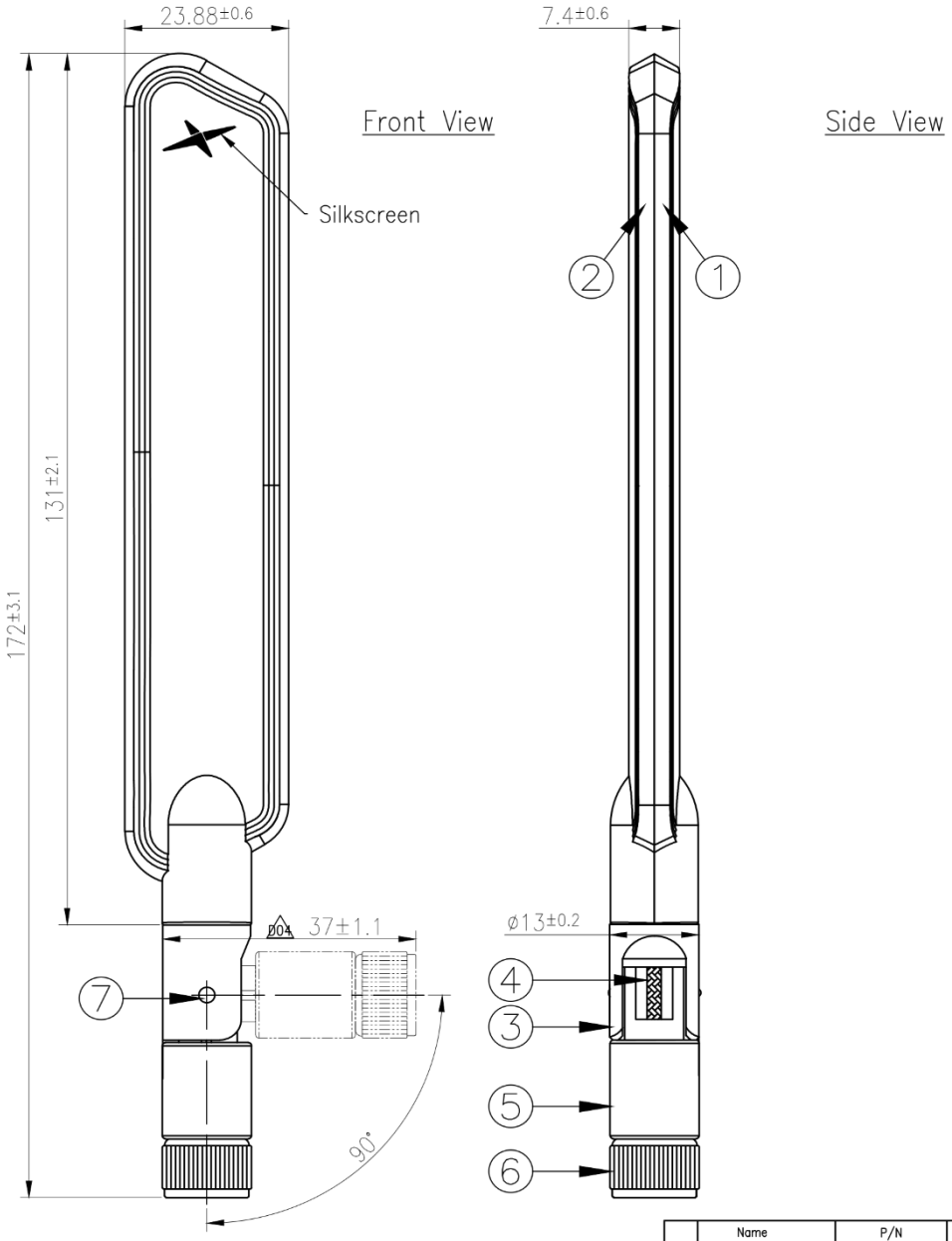
XZ Plane	YZ Plane	XY Plane
		

4.45 Straight on a 9x15cm Ground Plane Patterns at 5530 MHz



XZ Plane	YZ Plane	XY Plane
		

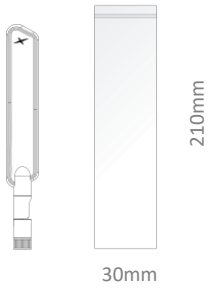
5. Mechanical Drawing



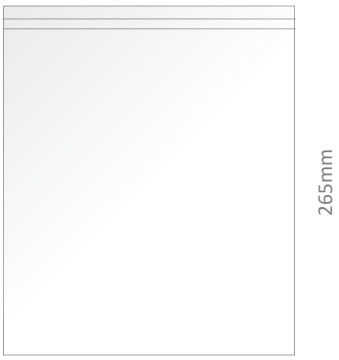
	Name	P/N	Material	Finish	QTY
1	Antenna Housing_Top	000119B020000A	PC+ABS	Black	1
2	Antenna Housing_Bottom	000119B030000A	PC+ABS	Black	1
3	Upper Base	001719C050000A	PBT+PC	Black	1
4	RG178 Coaxial Cable	001719C050000A	FEP	Brown	1
5	Bottom Base	001719C050000A	PBT+PC	Black	1
6	SMA(M)ST	001719C050000A	PBT+PC	Black	1
7	Rivet	001719C050000A	PBT+PC	Black	2

6. Packaging

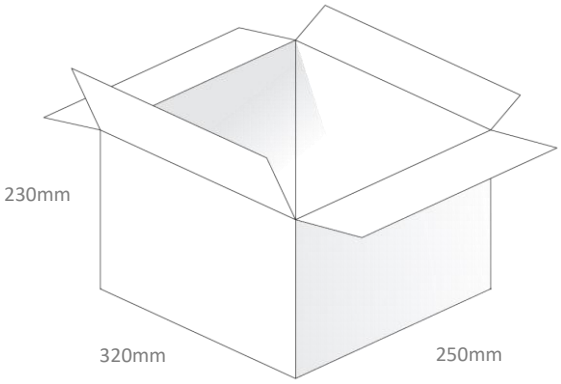
1pc TG.55 per Small PE Bag
Dimensions: 30*210mm
Weight: 31g



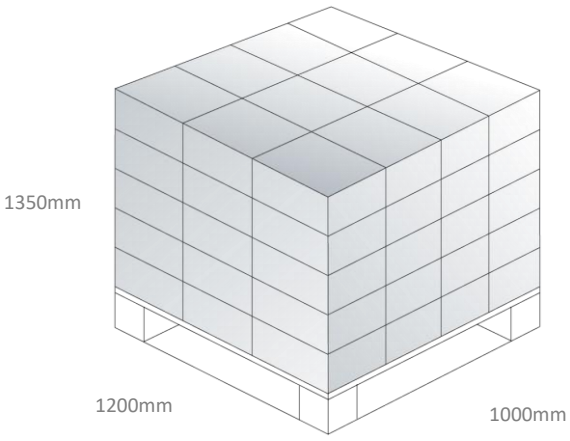
20pcs per Large PE Bag
Dimensions: 180*265mm
Weight: 620g



400pcs TG.55.8113 per Carton
Carton Dimensions: 320*250*230mm
Weight: 13Kg



Pallet Dimensions:
1200*1000*1350mm
60 Cartons per Pallet
12 Cartons per layer, 5 Layers



Changelog for the datasheet

SPE-19-8-061 – TG.55.8113

Revision: F (Current Version)	
Date:	2024-02-14
Changes:	Retested antenna and included GPS band extended coverage 1559-1610MHz.
Changes Made by:	Gary West

Previous Revisions

Revision: E	
Date:	2022-07-05
Changes:	Updated drawing
Changes Made by:	Jack Conroy

Revision: D	
Date:	2020-11-10
Changes:	Updated drawing
Changes Made by:	Jack Conroy

Revision: C	
Date:	2019-10-16
Changes:	Updated data to include new ground planes
Changes Made by:	Jack Conroy

Revision: B	
Date:	2019-08-29
Changes:	Updated description
Changes Made by:	David Connolly

Revision: A (Original First Release)	
Date:	2019-05-22
Notes:	Initial Specification Release
Author:	Jack Conroy

TAOGLAS®

www.taoglas.com