TAOGLAS®

Datasheet

Part No:
PCS.55.M

Description

Small OTS LTE Antenna 600-3000 MHz

Features:

Small form factor

SMD Dielectric Antenna

5G/4G/LTE: 600-3000MHz

GPS / GLONASS / Galileo / BeiDou (1561-1602MHz)

Available in North America (NA), European Union (EMEA), and World Wide (WW) configurations

Dimensions: 27 x 10 x 1.6 mm

RoHS & REACH Compliant

1. Introduction

The Taoglas PCS.55.M, is a patent pending compact cellular antenna designed specifically for IoT devices with small ground planes. It combines revolutionary antenna design techniques with the antenna integration experience of Taoglas to provide a solution for wideband coverage of both 5G/4G LTE and GNSS bands, including the most challenging 600-700MHz bands.

The PCS.55.M provides a simple off-the-shelf solution for LTE, LTE CAT-M, NB-IoT, and GNSS applications. At only 27 x 10 x 1.6 mm, this compact cellular antenna is the perfect antenna for small IoT devices, where requirements for smaller PCB design are becoming more dependent on the antenna size. This antenna also has a small keep-out area compared to most other compact cellular antennas on the market.

Typical Applications include:

- Tablets and Smartphones
- Compact Asset Trackers
- Smart Home and Security Devices
- Point-of-Sale (POS) Terminals
- Medical Devices

The PCS.55.M is available in three versions, each tuned for North America (NA), Europe (EMEA), and Worldwide (WW) frequency bands. Each version uses an optimized 3-component matching circuit, making it easy for designers to achieve the best performance for their specific region. The antenna is simple to integrate using standard SMD assembly methods, offering flexibility and fast design implementation.

Taoglas have tested how ground plane size, antenna placement, and MIMO configurations using the PCS.55.A and PCS.55.M effect performance. Results are available in Sections 9 and 10 of this datasheet.

For more information or support with integration and matching, please contact your local Taoglas support team.

2. Specifications

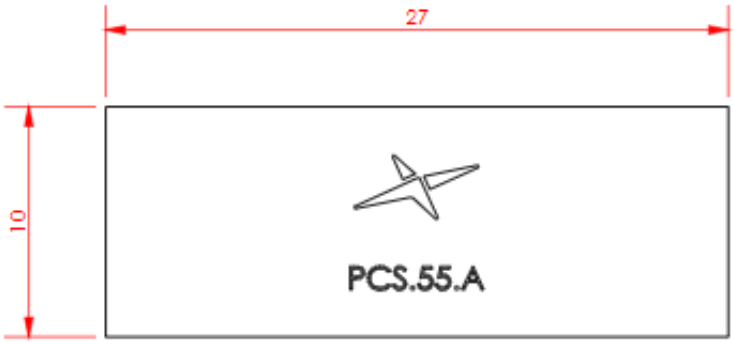
Electrical										
Band	Frequency (MHz)	Measurement	Efficiency (%)	Average Gain (dB)	Peak Gain (dBi)	Return Loss (dB)	Impedance	Polarization	Radiation Pattern	Max Input Power
5GNR Band71	617-698	NA	17.9	-7.5	-4.4	-2.5	50 Ω	Linear	Omni directional	10W
		EMEA	9.1	-10.4	-7.3	-2.5				
		WW	23.9	-6.2	-3.3	-4.7				
5GNR/4G Band 12,17,28,29,85	698-746	NA	47.4	-3.2	0.2	-8.5				
		EMEA	23.3	-6.3	-2.7	-4.1				
		WW	31.2	-5.1	-1.6	-3.7				
5GNR/4G Band 13,14,20,28	746-800	NA	41.7	-3.8	-0.3	-5.1				
		EMEA	31.1	-5.1	-1.5	-4.4				
		WW	31.7	-5.0	-1.5	-3.3				
5GNR/4G Band 5,18,19,20,26,27	800-880	NA	27.4	-5.6	-2.2	-3.1				
		EMEA	35.6	-4.5	-1.0	-5.0				
		WW	32.6	-4.9	-1.6	-4.1				
5GNR/4G Band 5,8,19,26	880-960	NA	16.1	-7.9	-4.4	-2.6				
		EMEA	26.6	-5.7	-1.8	-5.6				
		WW	23.6	-6.3	-2.6	-4.3				
5GNR/4G Band 74,75,76	1427-1518	NA	32.9	-4.8	0.4	-4.7				
		EMEA	24.8	-6.1	-1.0	-3.1				
		WW	31.9	-5.0	0.4	-5.0				
GNSS	1560-1602	NA	43.3	-3.6	1.2	-5.9				
		EMEA	35.2	-4.5	0.7	-4.7				
		WW	43.3	-3.6	1.6	-6.3				
4G/3G Band 1,2,3,4,25,39,66	1710-2155	NA	46.6	-3.3	3.7	-6.3				
		EMEA	47.4	-3.2	3.3	-6.6				
		WW	43.0	-3.7	3.5	-5.9				
4G/3G Band 7, 38, 41, 69	2500-2690	NA	14.7	-8.3	-2.0	-1.8				
		EMEA	20.9	-6.8	-0.4	-2.2				
		WW	18.6	-7.3	0.0	-2.2				
The PCS.55.M antenna was measured with Taoglas PCSD.55.A EVB.										

Mechanical	
Antenna Dimensions	27 x 10 x 1.6mm
Material	FR4
Weight	0.9g
Soldering Type	SMD

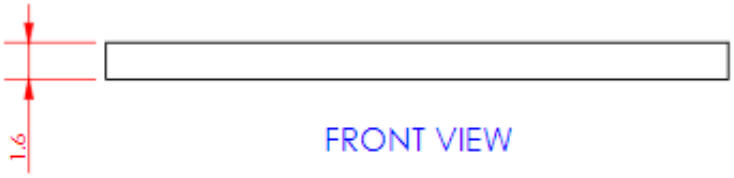
Environmental	
Operation Temperature	-40°C ~ +85°C
Storage Temperature	-40°C ~ +85°C
Moisture Sensitivity Level	3

5G/4G Bands					
Band Number	5GNR / FR1 / LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA				
	Uplink	Downlink	EMEA	NA	WW
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	✗	✗	✗

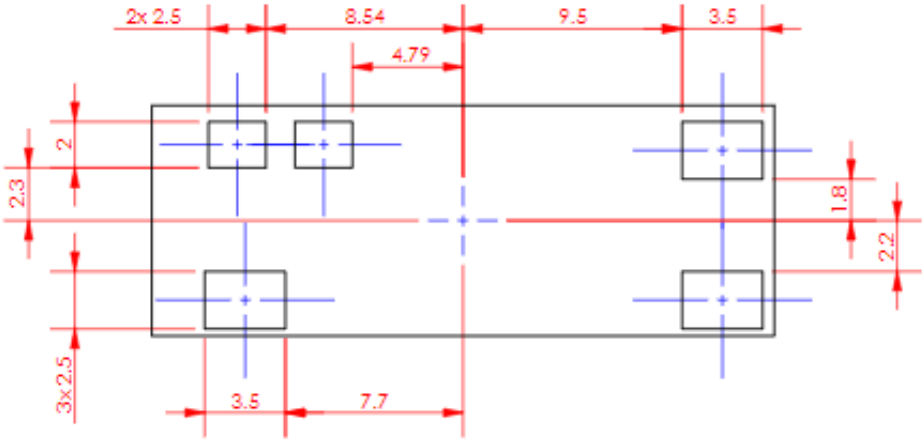
3. Mechanical Drawing



TOP VIEW



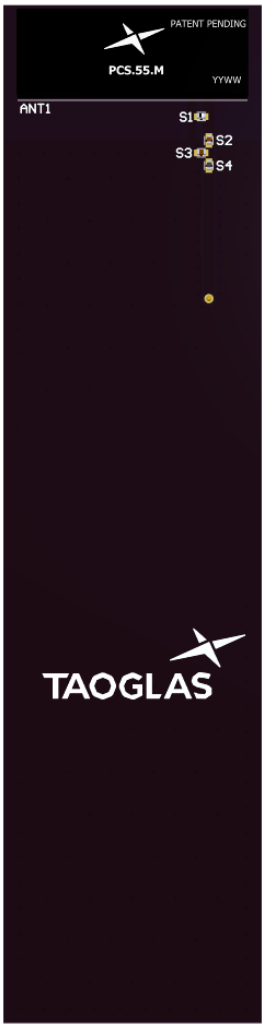
FRONT VIEW



BOTTOM VIEW

4. Antenna Integration Guide

The following is an example on how to integrate the PCS.55.M into a design. This antenna has 5 pins, where one pin is used for the RF Feed. Taoglas recommends using a minimum of 104x30mm ground plane (PCB) to ensure optimal performance.



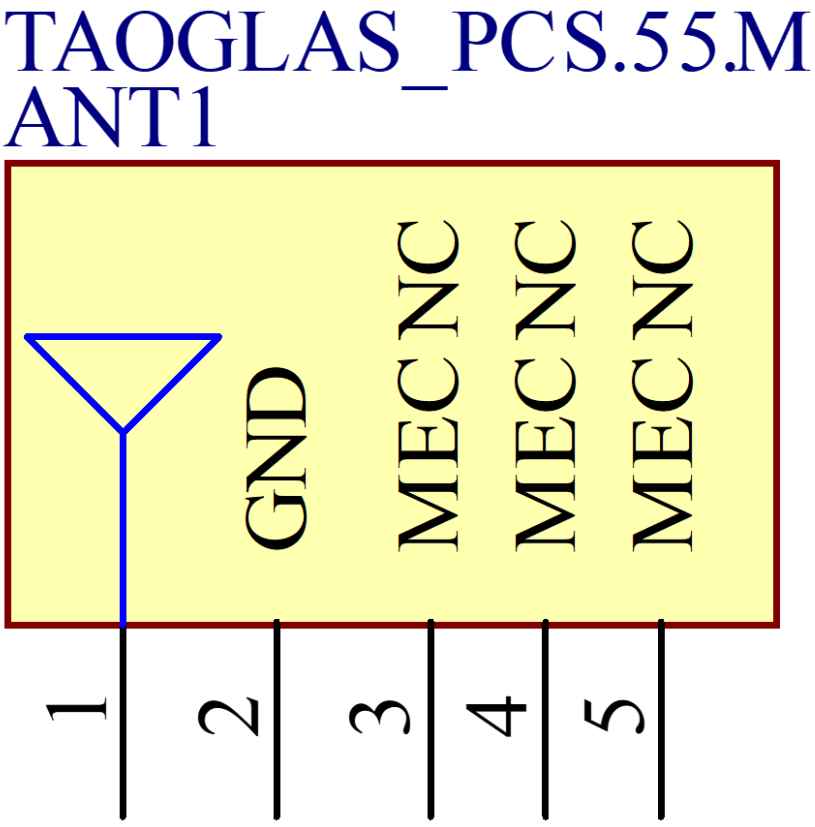
Top view of PCB reference design

Please find the Integration files in Altium, 2D formats and the 3D model for the PCS.55.M here: https://www.taoglas.com/product/pcs-55-m-small-fr4-wideband-4g-lte-antenna/

4.1 Schematic and Symbol Definition

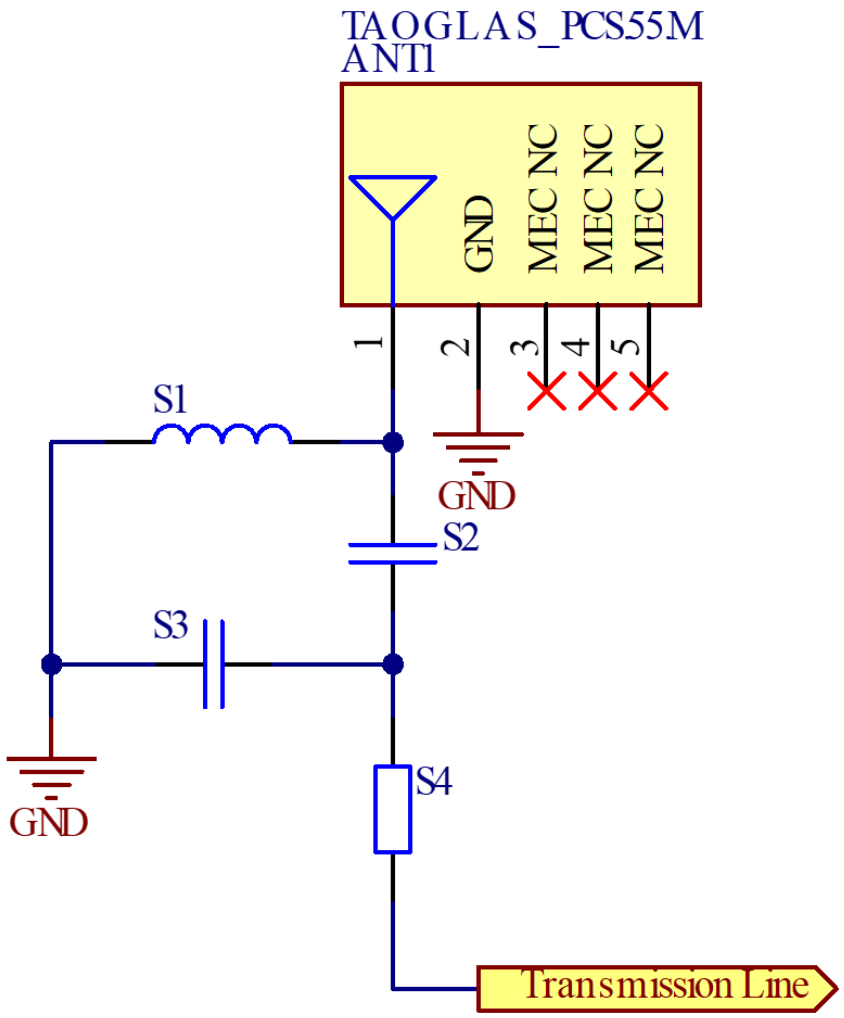
The circuit symbol for the PCS.55.M is shown below. The antenna has 4 pins as indicated below.

Pin	Description
1	RF Feed
2	Ground
3, 4, 5	Mechanical, Not Connected



4.2 Schematic Layout - NA

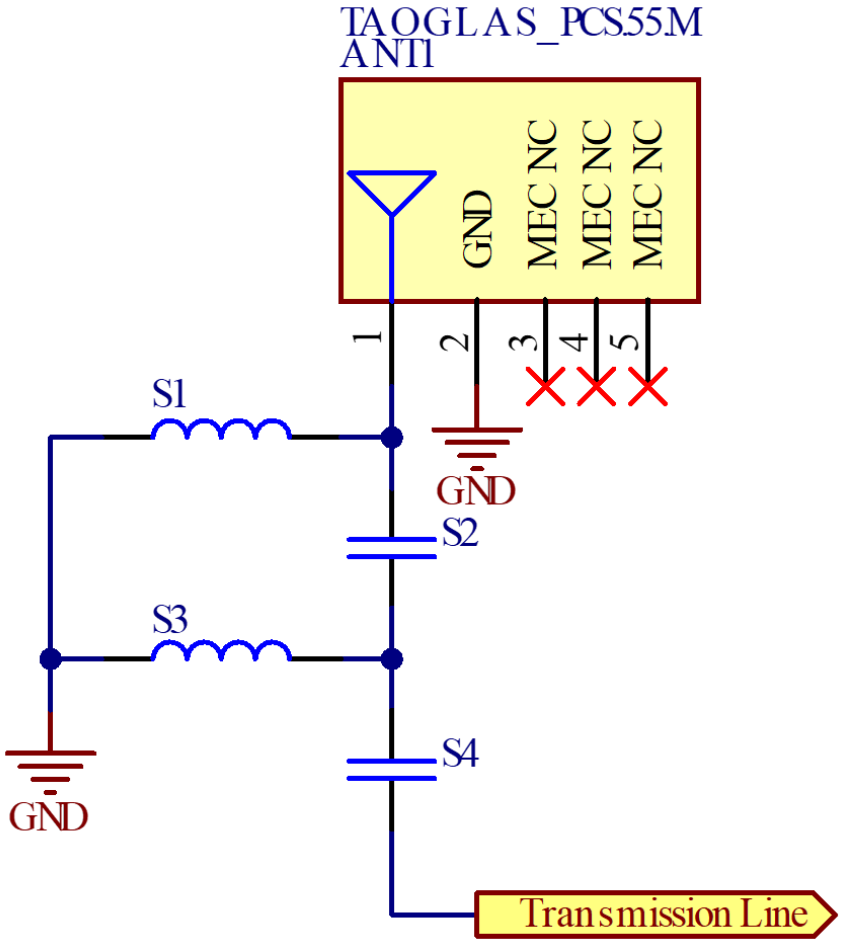
Matching components with the PCS.55.M are required for the antenna to have optimal performance in the spaces specified in the schematic below. Additional matching components may be necessary for your device, Taoglas recommends incorporating extra component footprints, forming a “pi” network, for the PCS.55.M.



Designator	Type	Value	Manufacturer	Manufacturer Part Number
S1	Inductor	8.2nH	TDK	MLG1005S8N2JT000
S2	Capacitor	2.7pF	Murata	GCM1555C1H2R7BA16D
S3	Capacitor	0.5pF	Murata	GRM1555C1HR50CA01D
S4	Resistor	0 Ohm	YAGEO	RC0402JR-070RL

4.3 Schematic Layout - EMEA

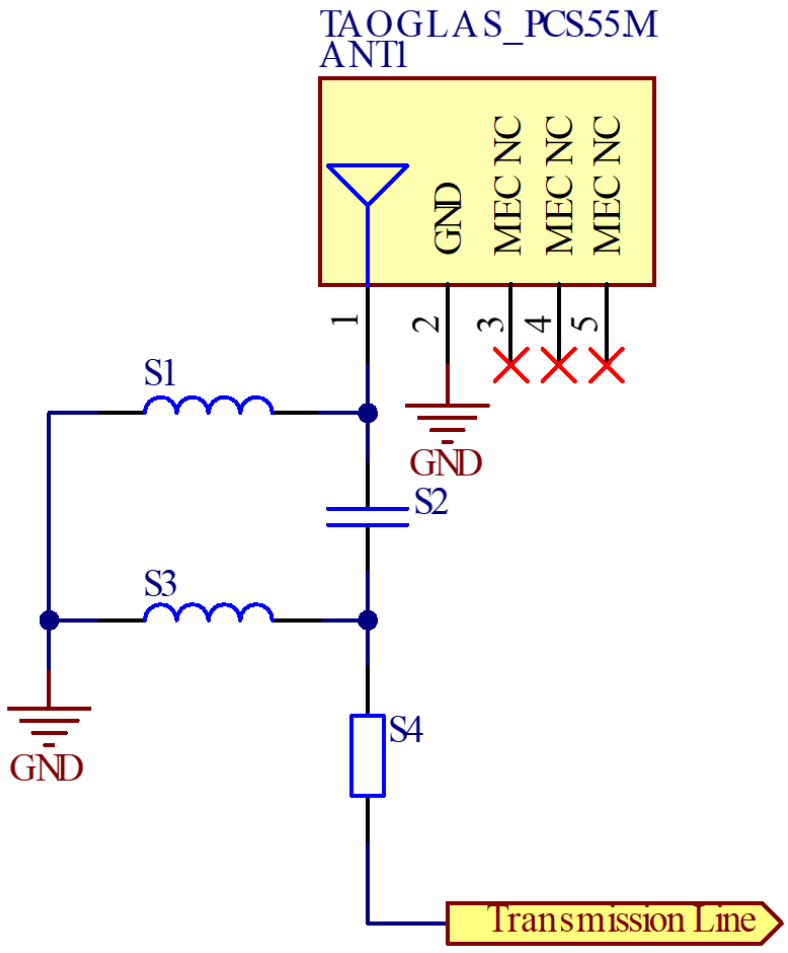
Matching components with the PCS.55.M are required for the antenna to have optimal performance in the spaces specified in the schematic below. Additional matching components may be necessary for your device, Taoglas recommends incorporating extra component footprints, forming a “T” network, for the PCS.55.M.



Designator	Type	Value	Manufacturer	Manufacturer Part Number
S1	Inductor	Not Fitted	-	-
S2	Capacitor	4.3pF	Murata	GJM1555C1H4R3BB01D
S3	Inductor	10nH	TDK	MHQ1005P10NJT000
S4	Capacitor	3.3pF	Murata	GJM1555C1H3R3BB01D

4.4 Schematic Layout - WW

Matching components with the PCS.55.M are required for the antenna to have optimal performance in the spaces specified in the schematic below. Additional matching components may be necessary for your device, Taoglas recommends incorporating extra component footprints, forming a “pi” network, for the PCS.55.M.

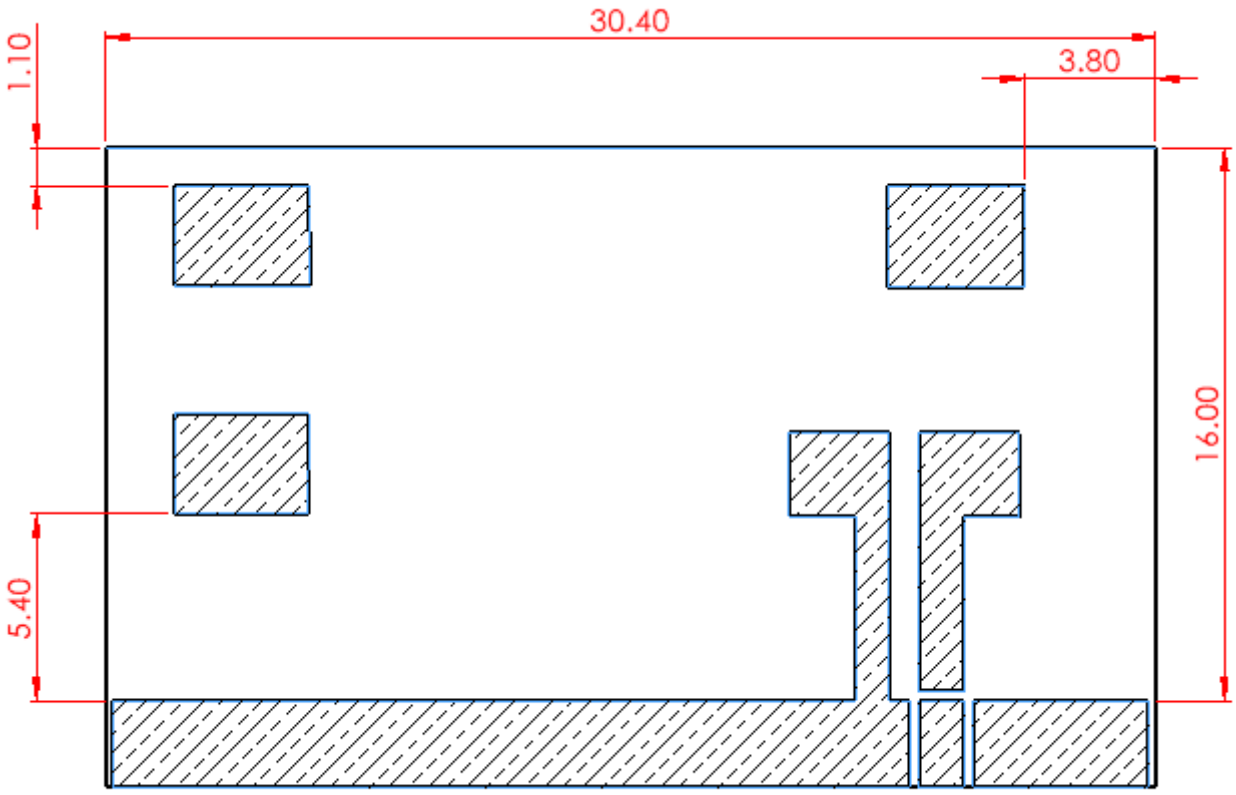


Designator	Type	Value	Manufacturer	Manufacturer Part Number
S1	Inductor	10nH	TDK	MHQ1005P10NJT000
S2	Capacitor	2.2pF	Murata	GJM1555C1H2R2BB01D
S3	Inductor	15nH	TDK	MHQ1005P15NJT000
S4	Resistor	0 Ohm	YAGEO	RC0402JR-070RL

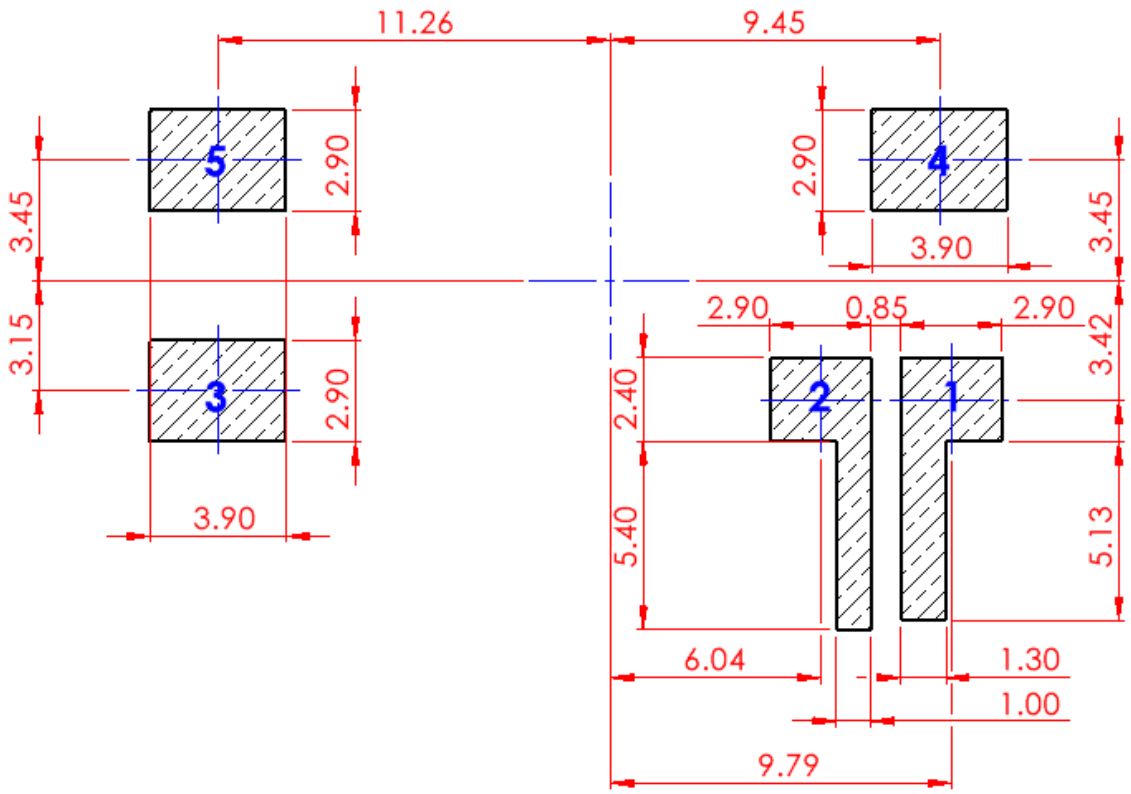
4.5 Copper Clearance

The footprint and clearance on the PCB must comply with the antenna's specification. The PCB layout shown in the diagrams below demonstrates the PCS.55.M clearance area. The copper keep out area applies to all layers that are below the PCS.55.M.

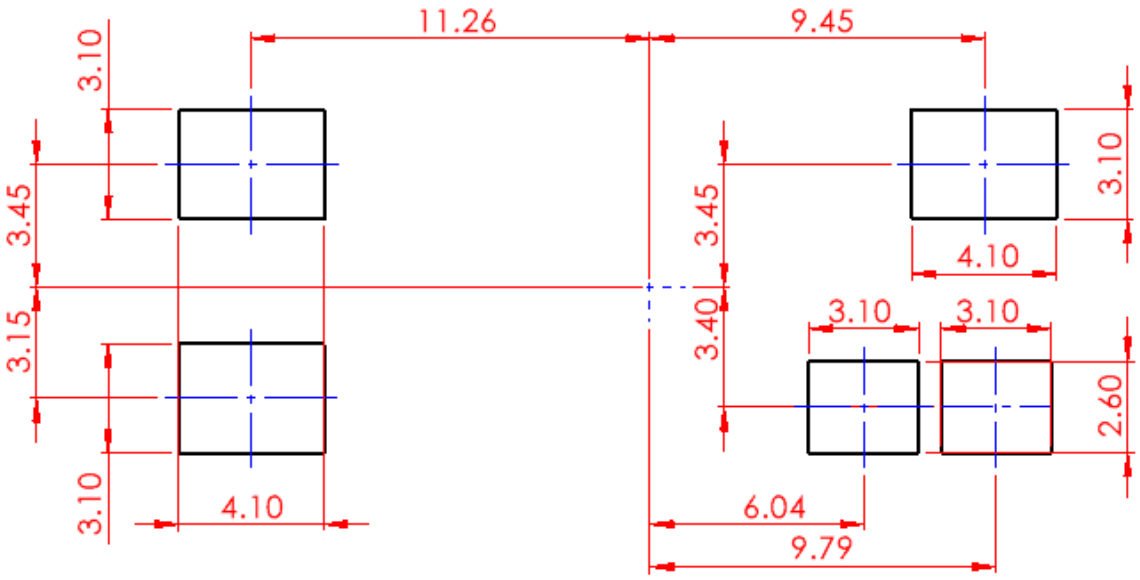
The copper clearance area should extend to 5.4mm from the antenna pads to the ground plane. The PCB edge clearance should be 1.1mm.



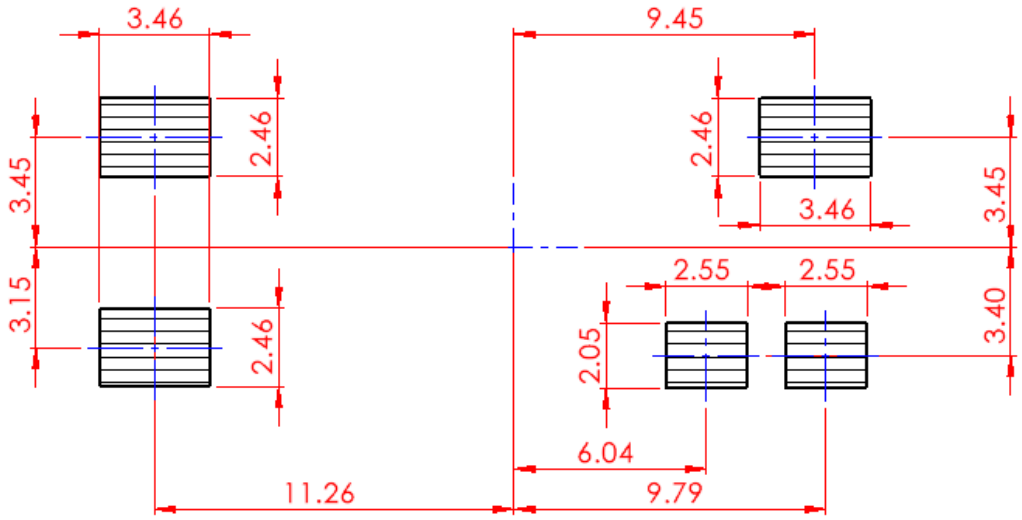
4.6 Footprint



4.7 Top Solder Mask

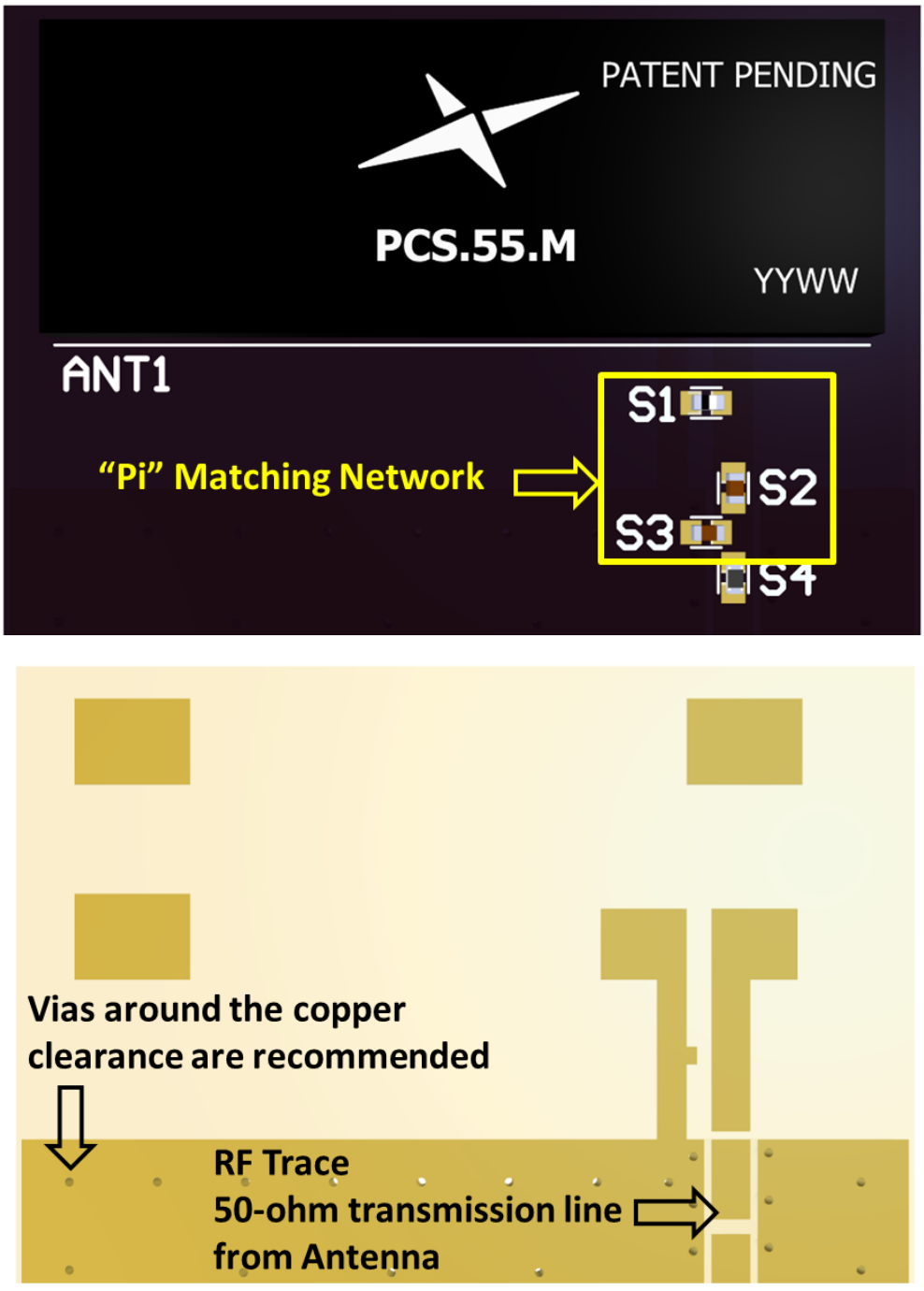


4.8 Top Solder Paste



4.9 Antenna Integration – NA & WW

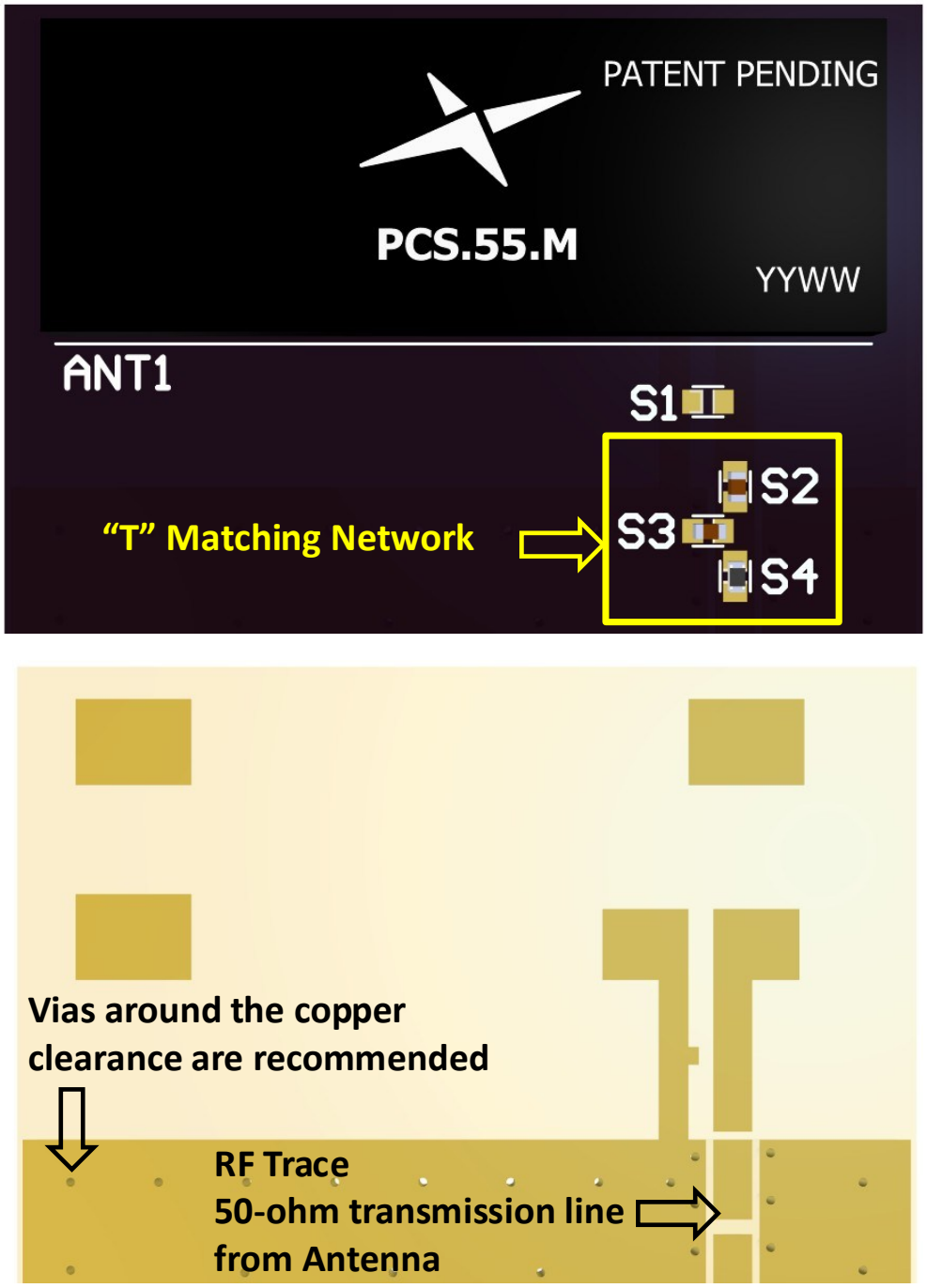
The PCS.55.M should be placed in the centre, as close to the edge on the long side of the PCB as possible, to take advantage of the ground plane. The RF trace must maintain a 50 Ohm transmission line. A “pi” Matching Network is recommended for the RF transmission line, the values and components for the matching circuit will depend on the tuning needed. Ground vias should be placed around the transmission line and the copper clearance area.



PCS.55.M antenna mounted on a PCB, showing the transmission line and integration notes

4.10 Antenna Integration – EMEA

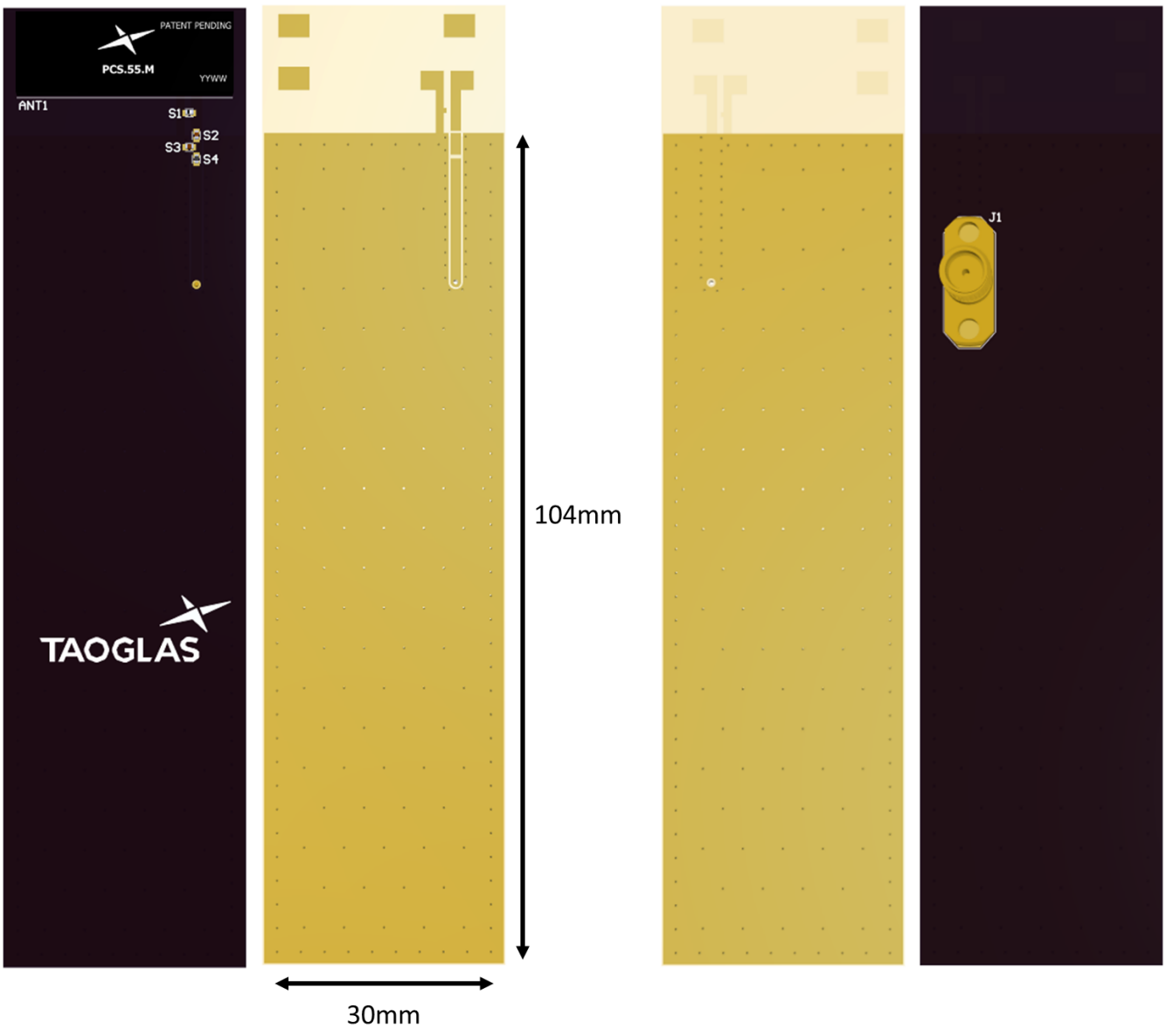
The PCS.55.M should be placed in the centre, as close to the edge on the long side of the PCB as possible, to take advantage of the ground plane. The RF trace must maintain a 50 Ohm transmission line. A “T” Matching Network is recommended for the RF transmission line, the values and components for the matching circuit will depend on the tuning needed. Ground vias should be placed around the transmission line and the copper clearance area.



PCS.55.M antenna mounted on a PCB, showing the transmission line and integration notes

4.11 Final Integration

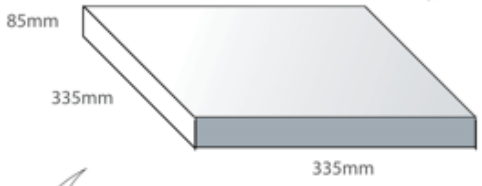
The top side image shown below highlights the antenna transmission line. Taoglas recommends using a minimum of 104x30mm ground plane (PCB) to ensure optimal performance.



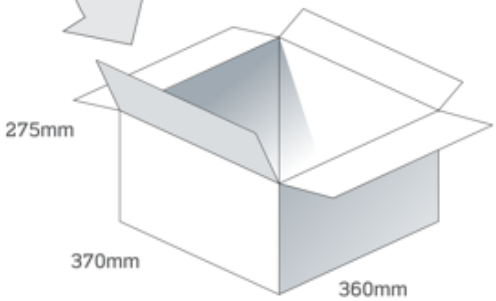
5. Packaging

1000 pc PCS.55.A per reel
Dimensions – Ø330*60
Weight – 1630g

1000 pc PCS.55.A / 1 reel in small box
Dimensions – Ø335*335*85mm
Weight – 1.9Kg

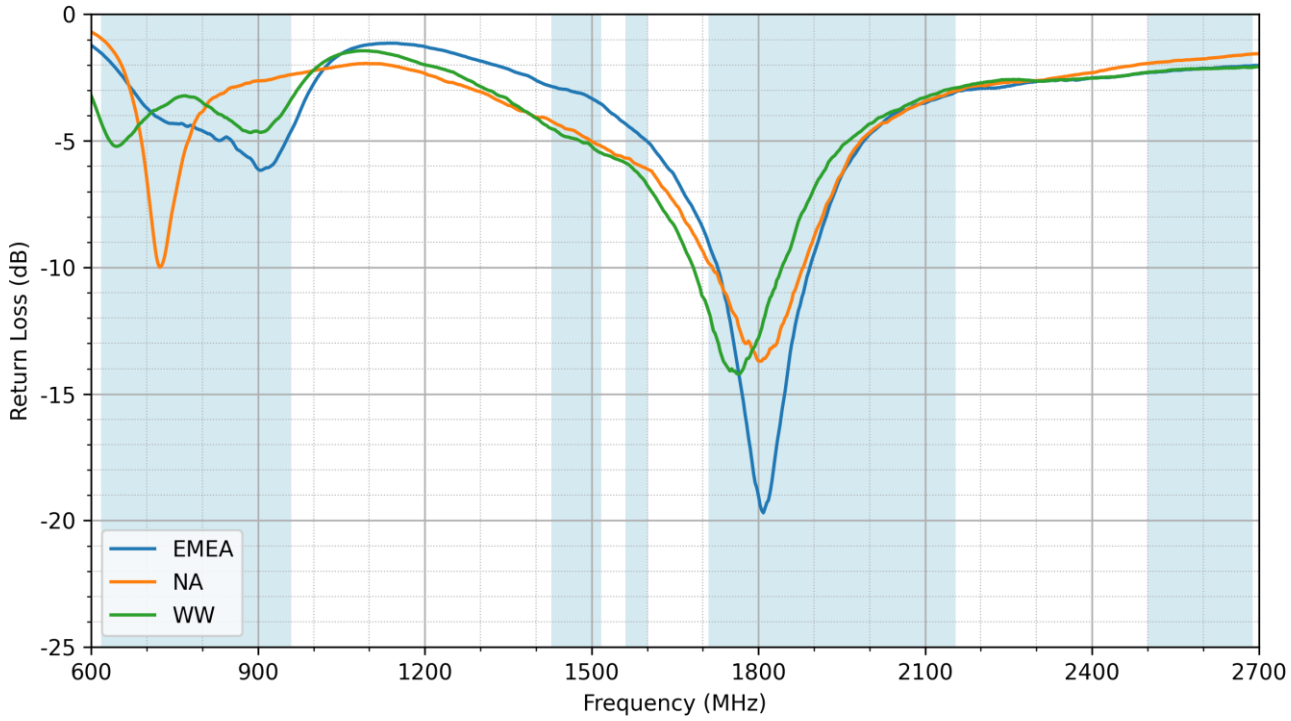


3 reels, 3000 pcs in one carton
Carton dimensions – 370*360*275mm
Weight – 6.5Kg

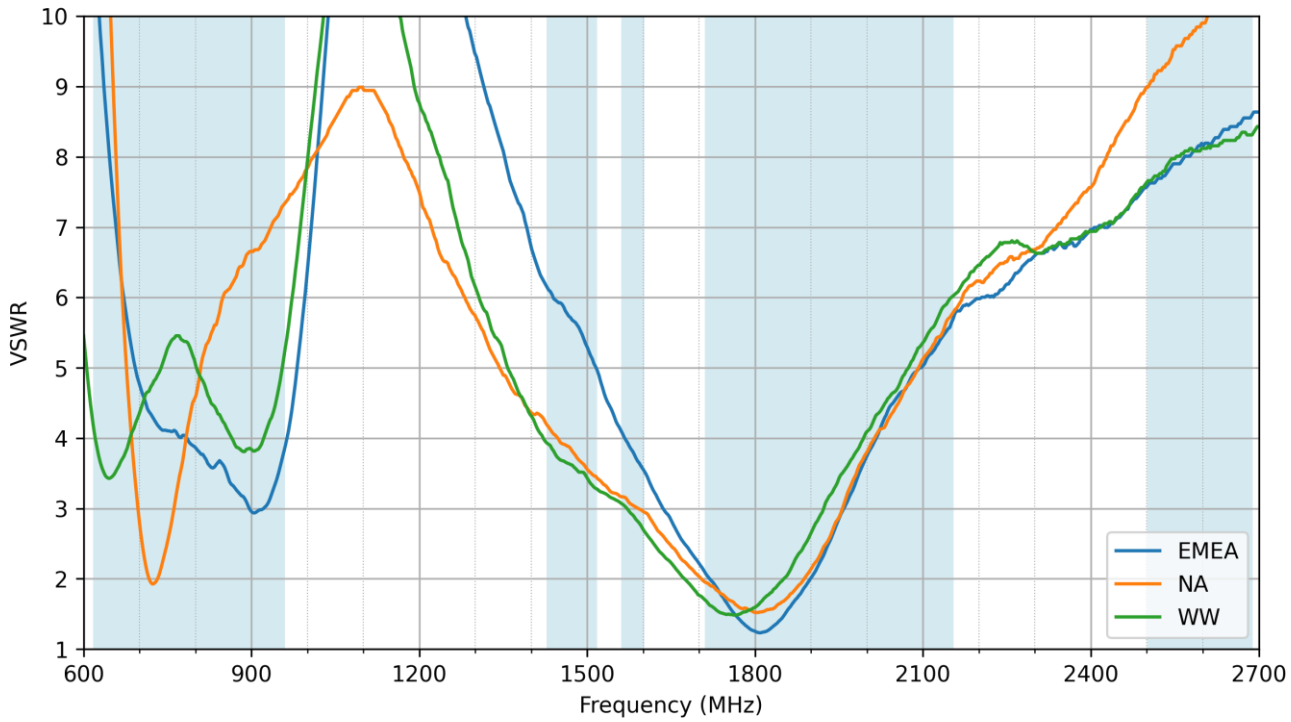


6. Antenna Characteristics

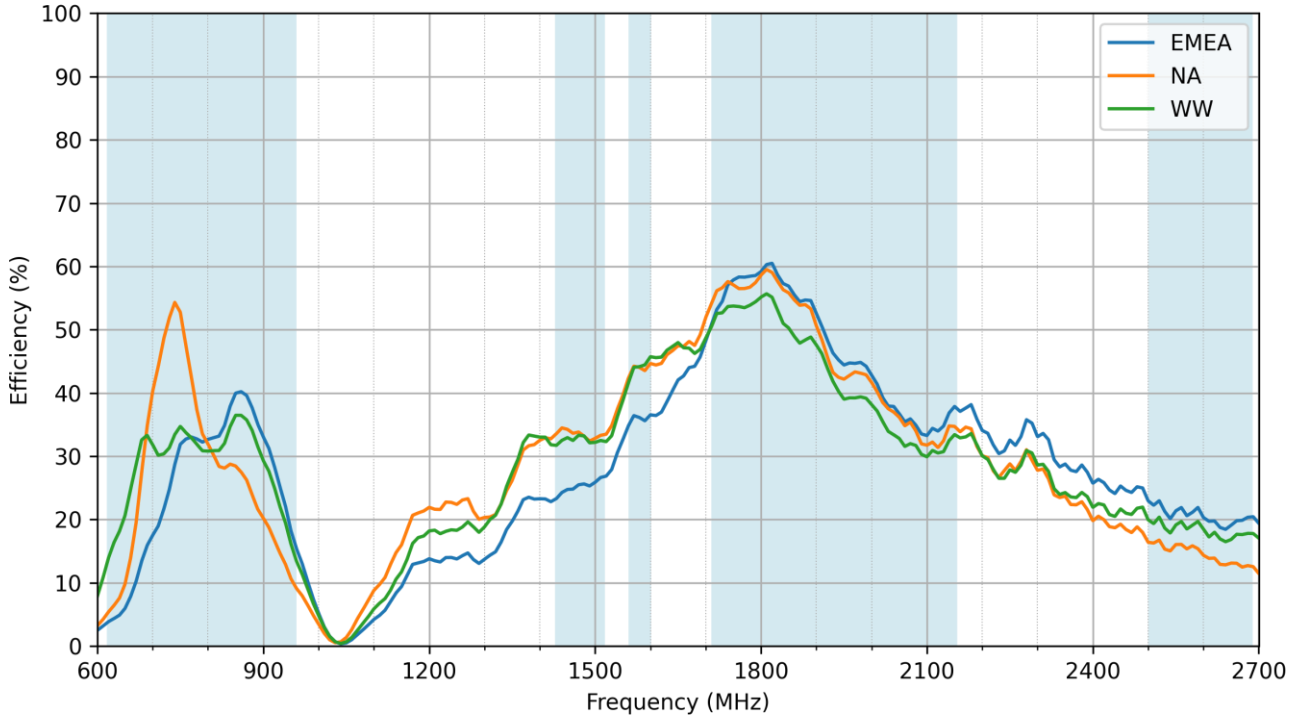
6.1 Return Loss



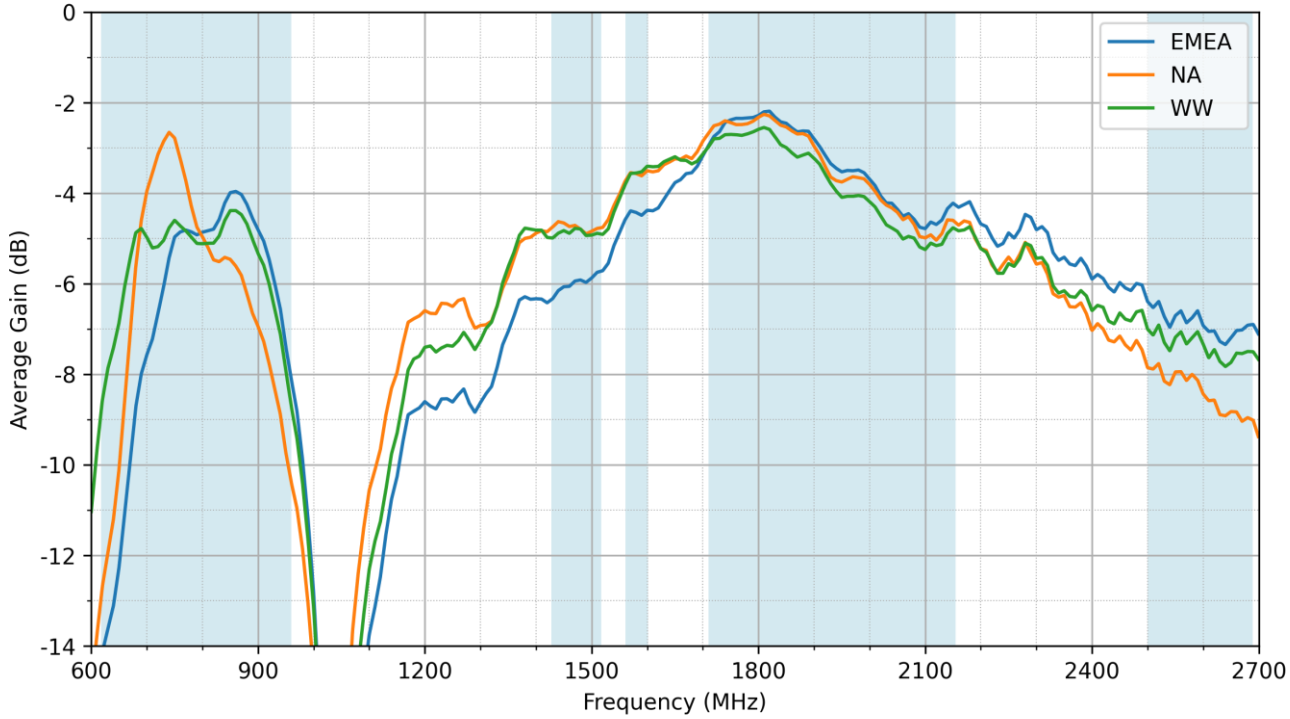
6.2 VSWR



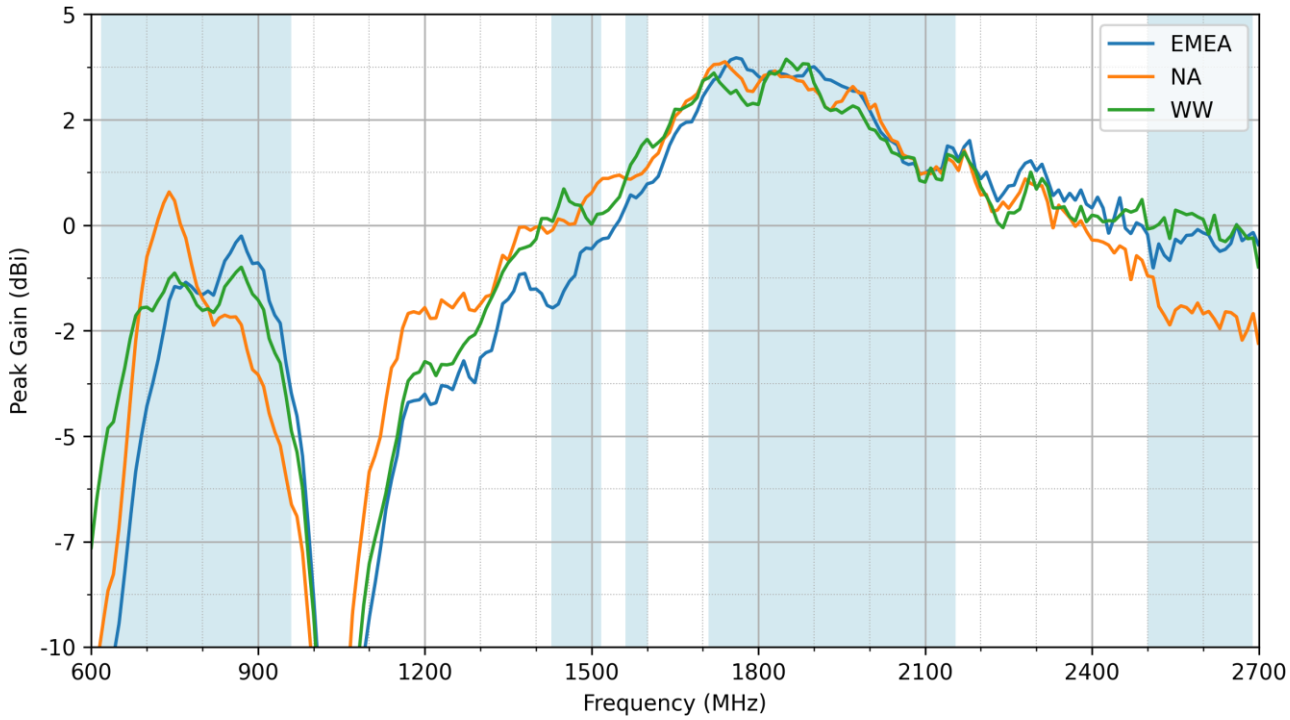
6.3 Efficiency



6.4 Average Gain

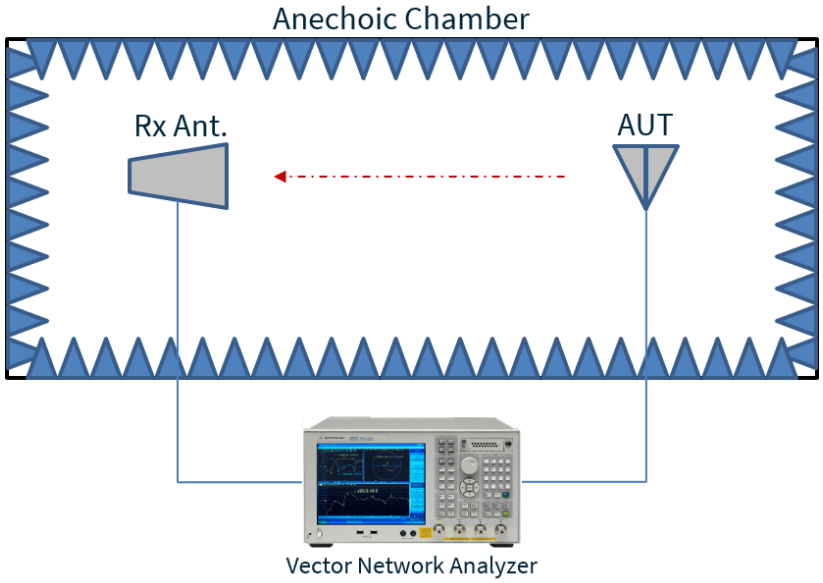


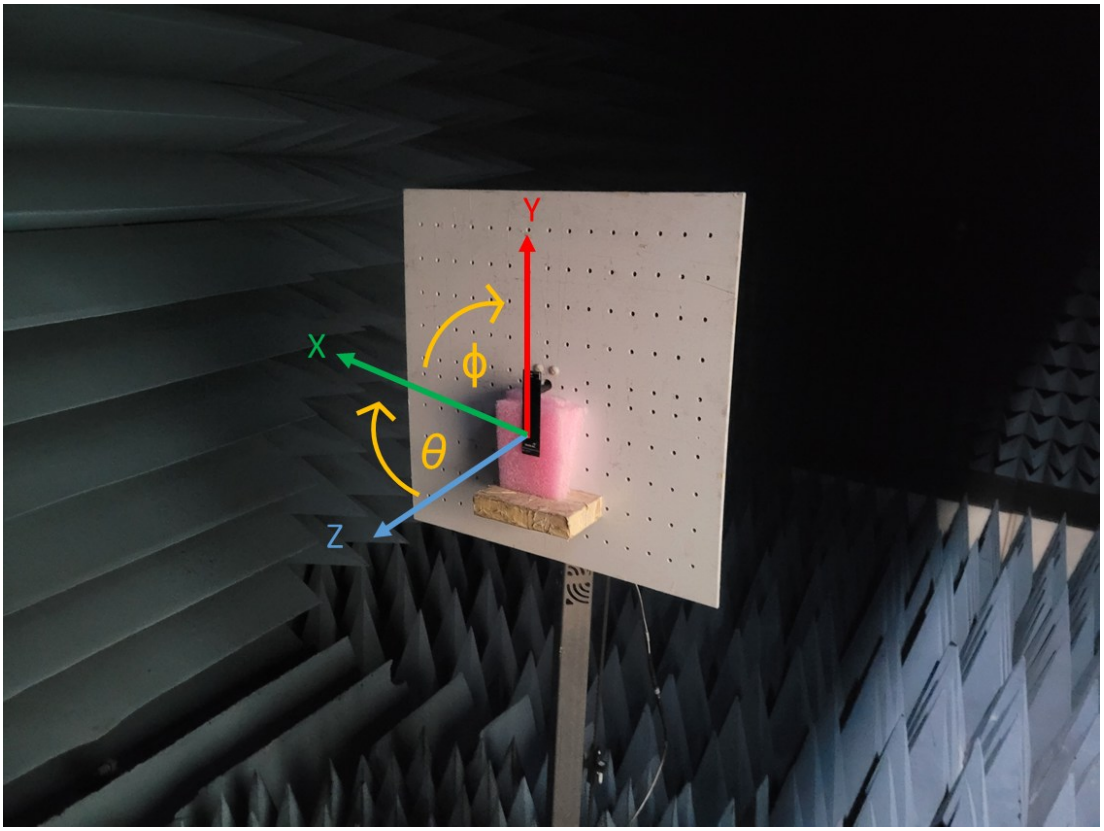
6.5 Peak Gain


EMEA
NA
WW
Peak Gain (dBi)
5
2
0
-2
-5
-7
-10
600
900
1200
1500
1800
2100
2400
2700
Frequency (MHz)

7. Radiation Patterns

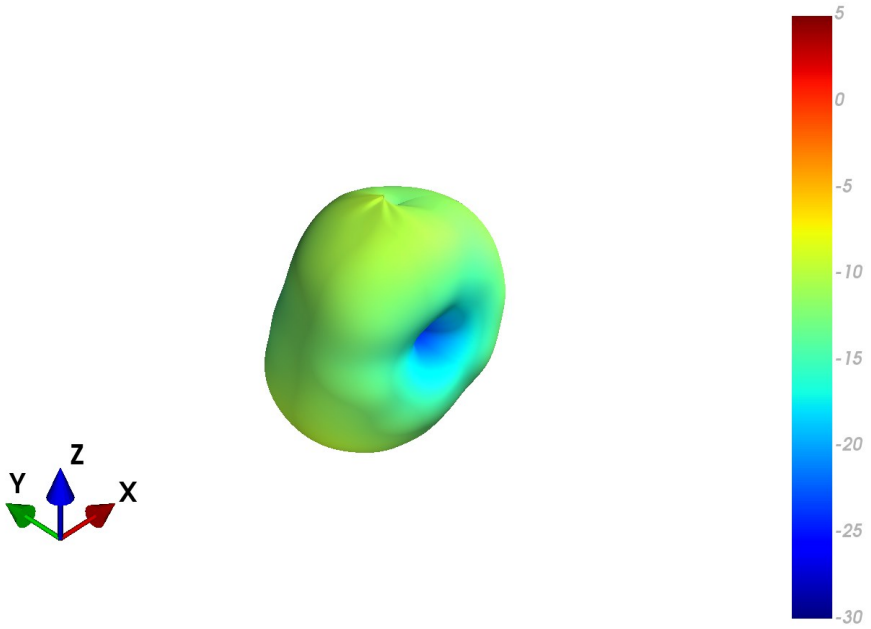
7.1 Test Setup

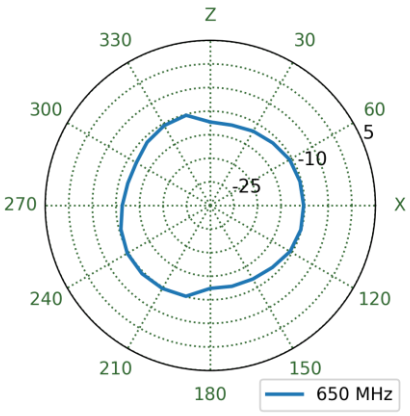
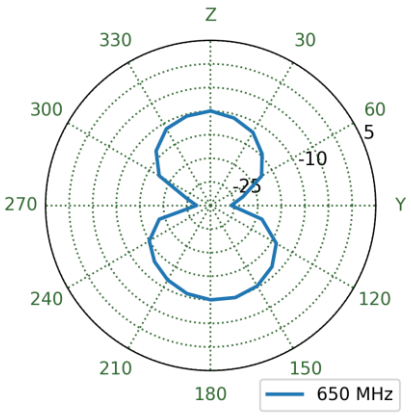
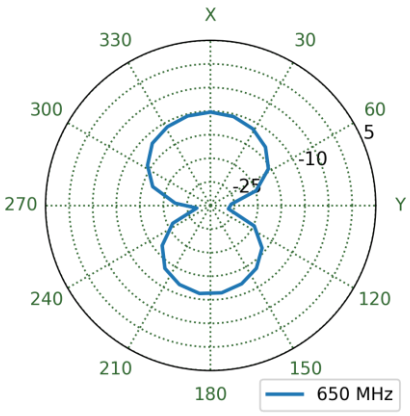




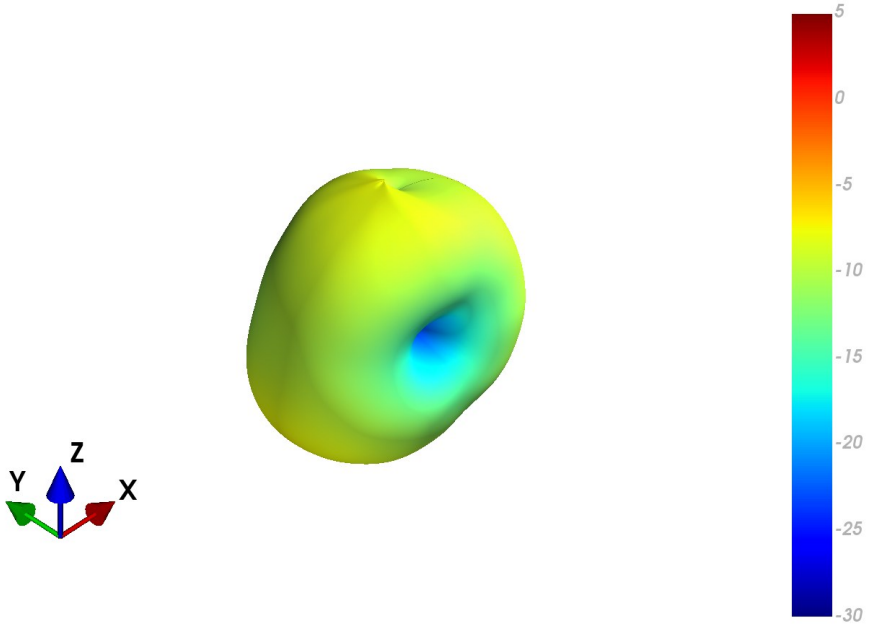
Chamber Test Set-up

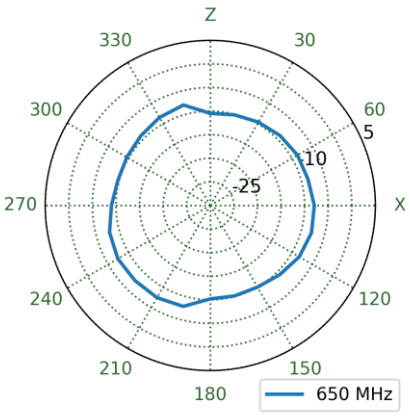
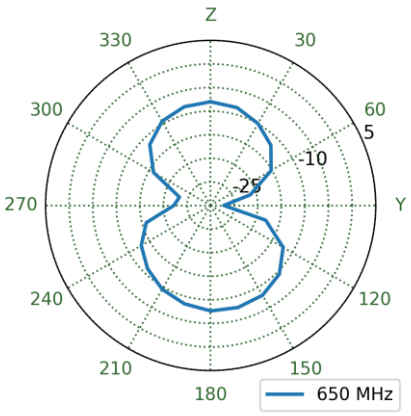
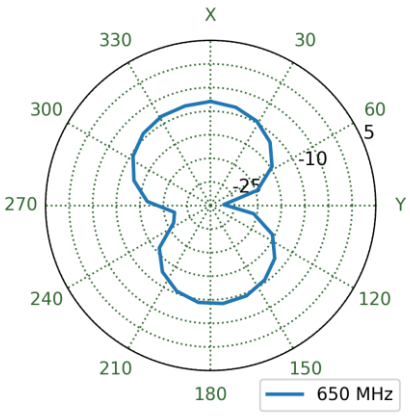
7.2 EMEA Patterns at 650 MHz



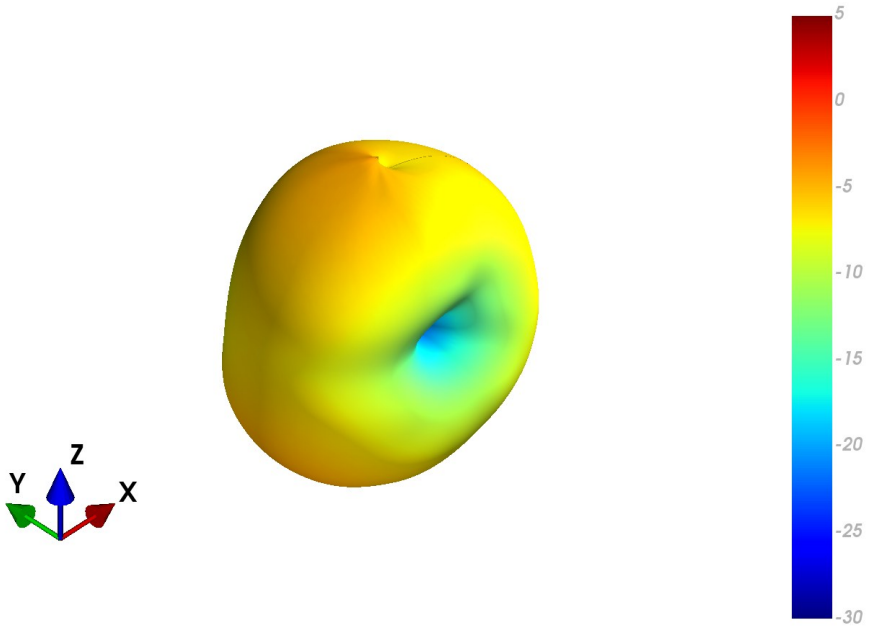
XZ Plane	YZ Plane	XY Plane
		

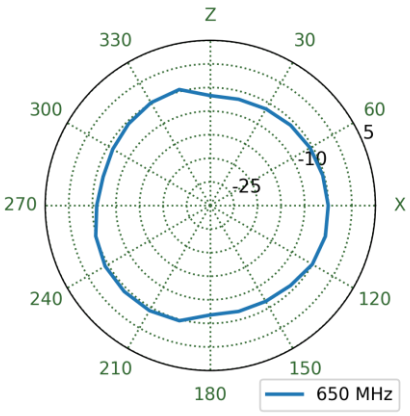
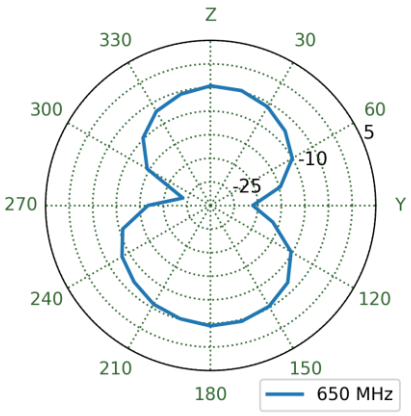
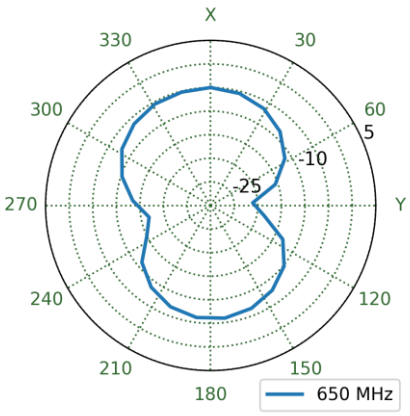
7.3 NA Patterns at 650 MHz



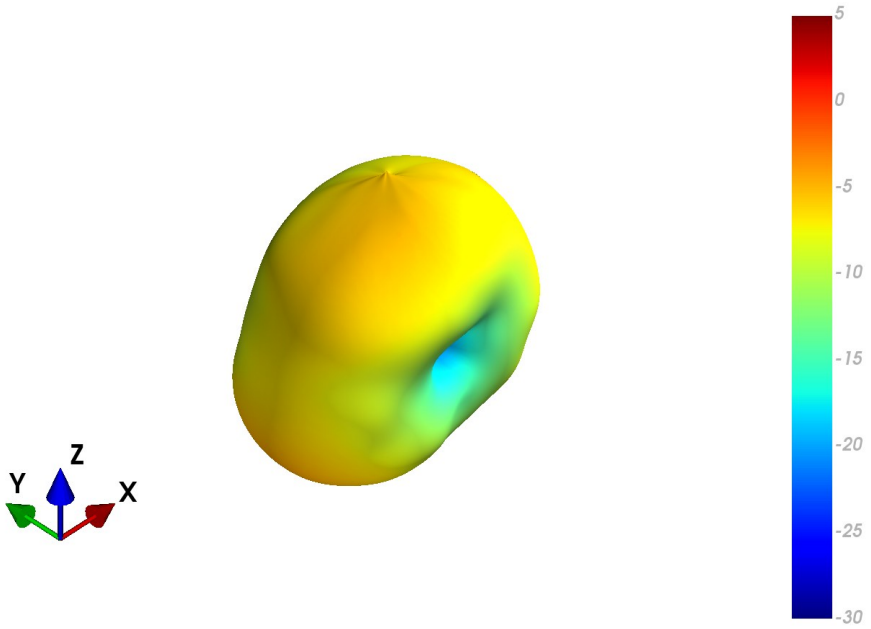
XZ Plane	YZ Plane	XY Plane
		

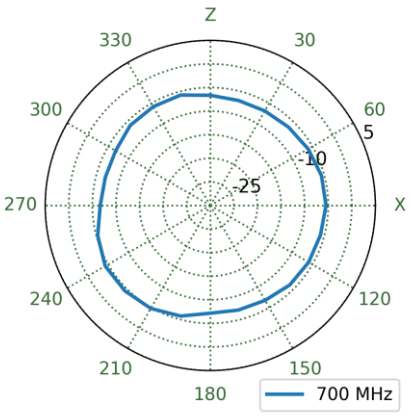
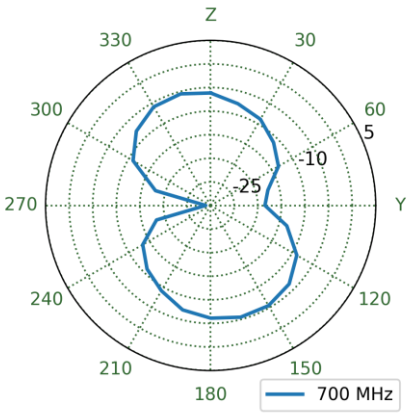
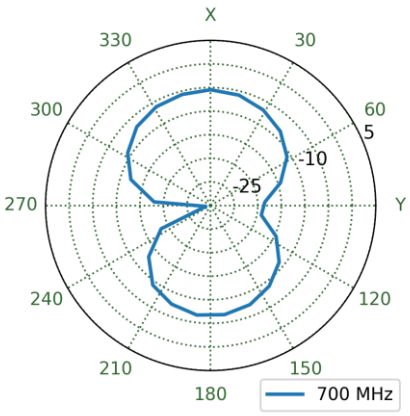
7.4 WW Patterns at 650 MHz



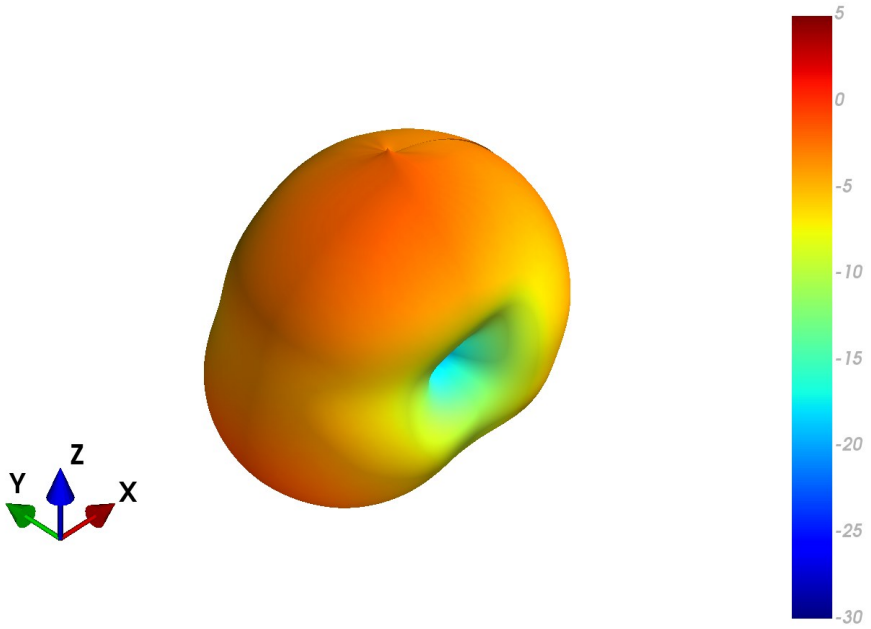
XZ Plane	YZ Plane	XY Plane
		

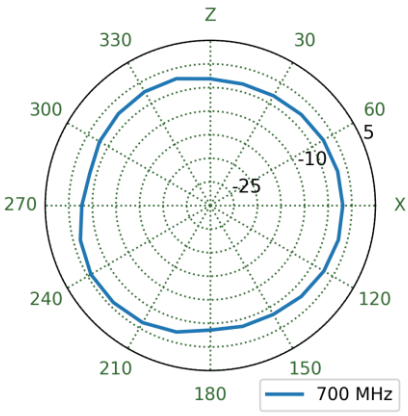
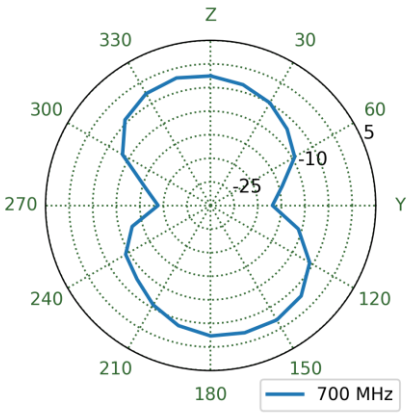
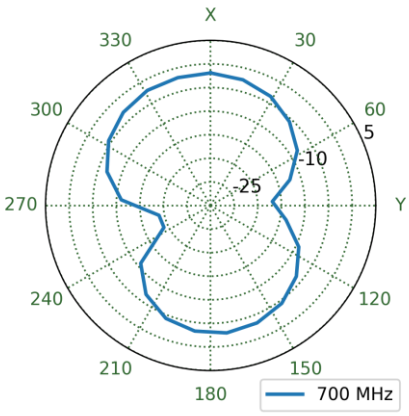
7.5 EMEA Patterns at 700 MHz



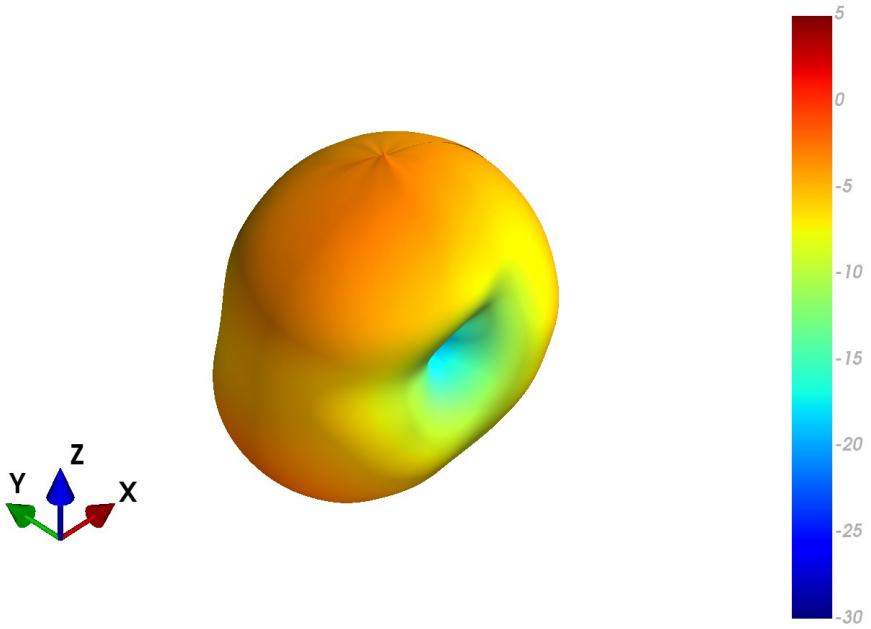
XZ Plane	YZ Plane	XY Plane
		

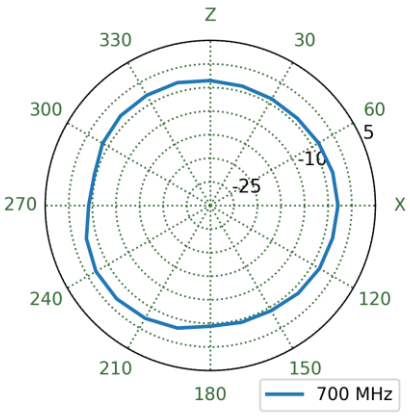
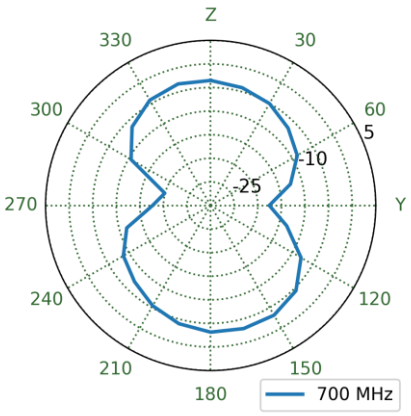
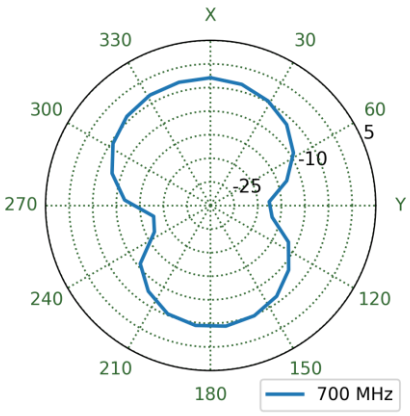
7.6 NA Patterns at 700 MHz



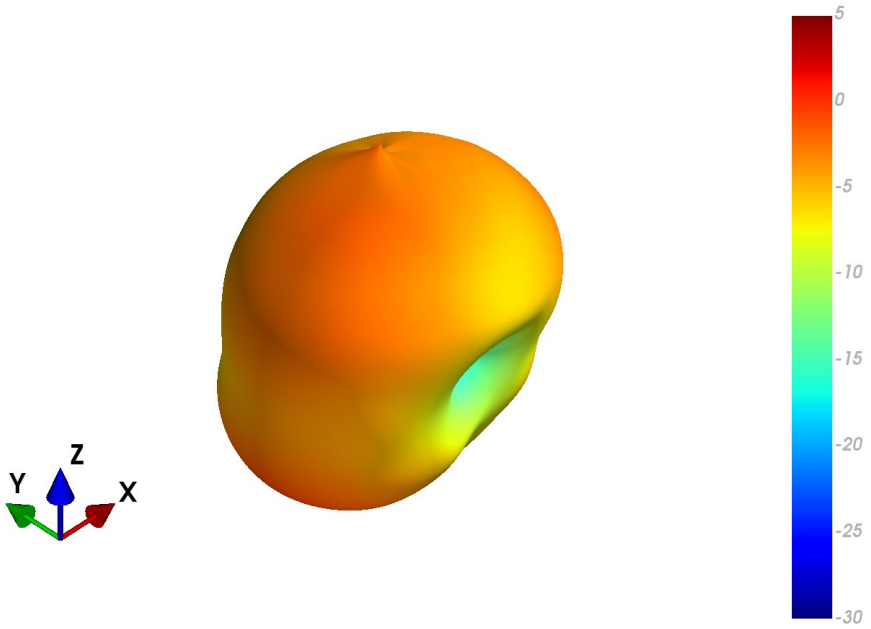
XZ Plane	YZ Plane	XY Plane
		

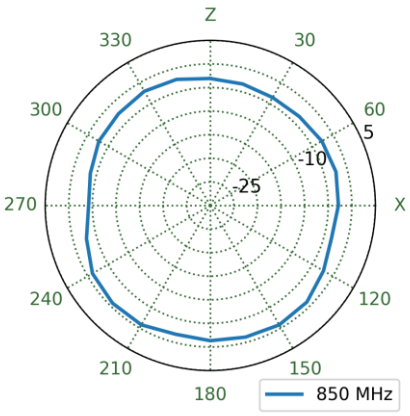
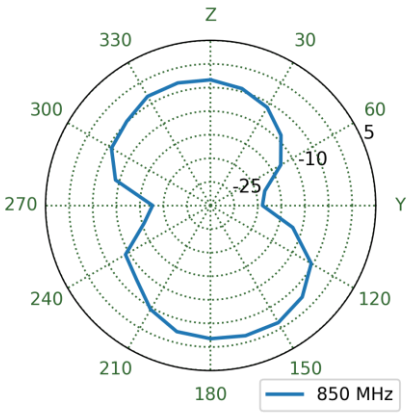
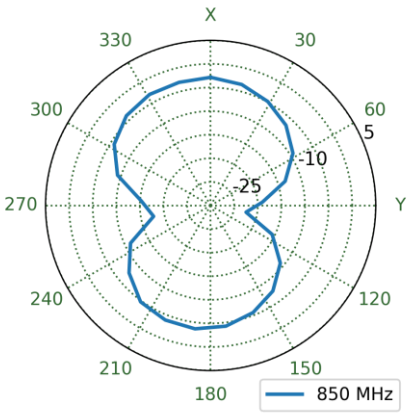
7.7 WW Patterns at 700 MHz



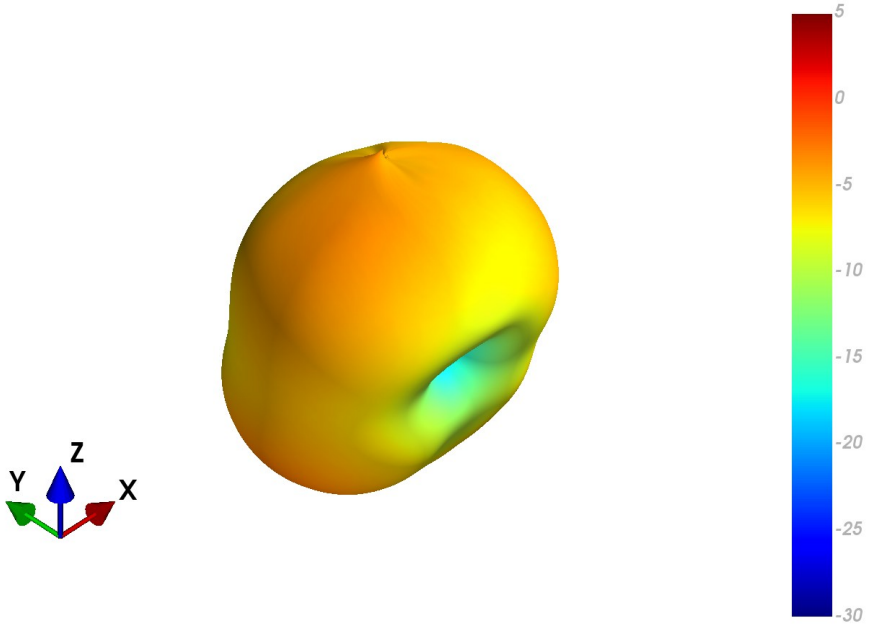
XZ Plane	YZ Plane	XY Plane
		

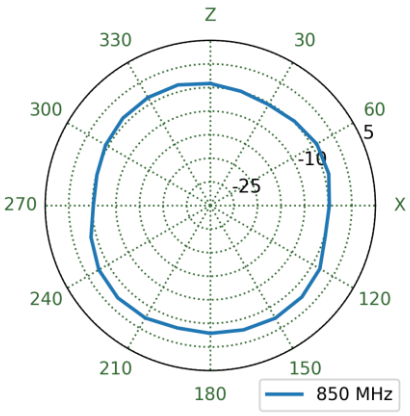
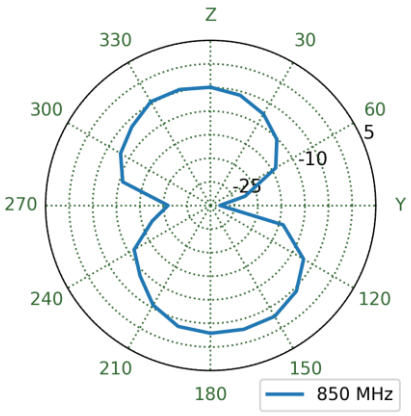
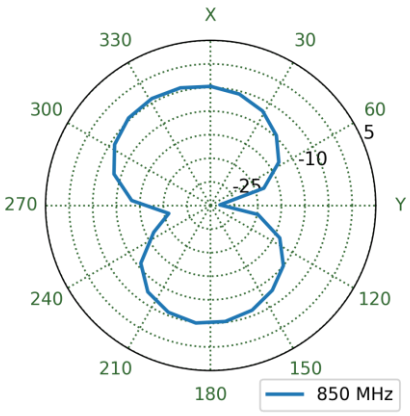
7.8 EMEA Patterns at 850 MHz



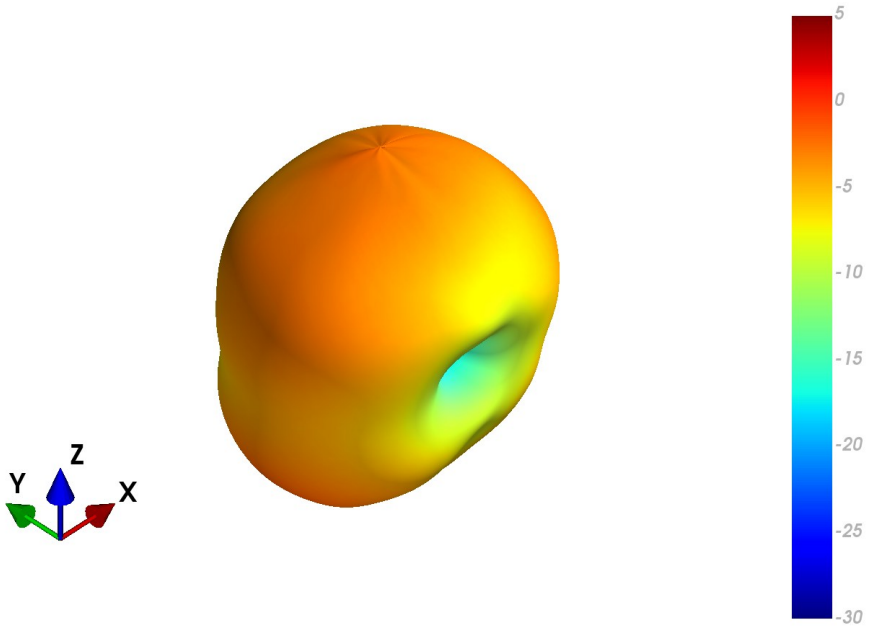
XZ Plane	YZ Plane	XY Plane
		

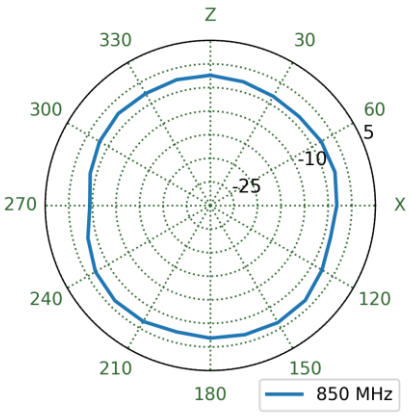
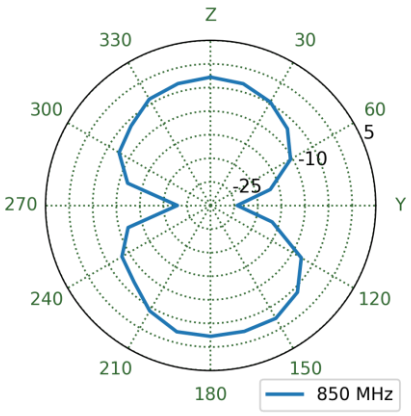
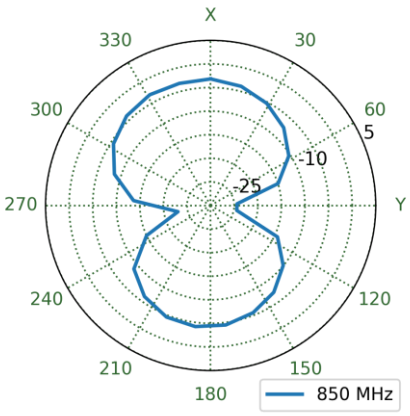
7.9 NA Patterns at 850 MHz



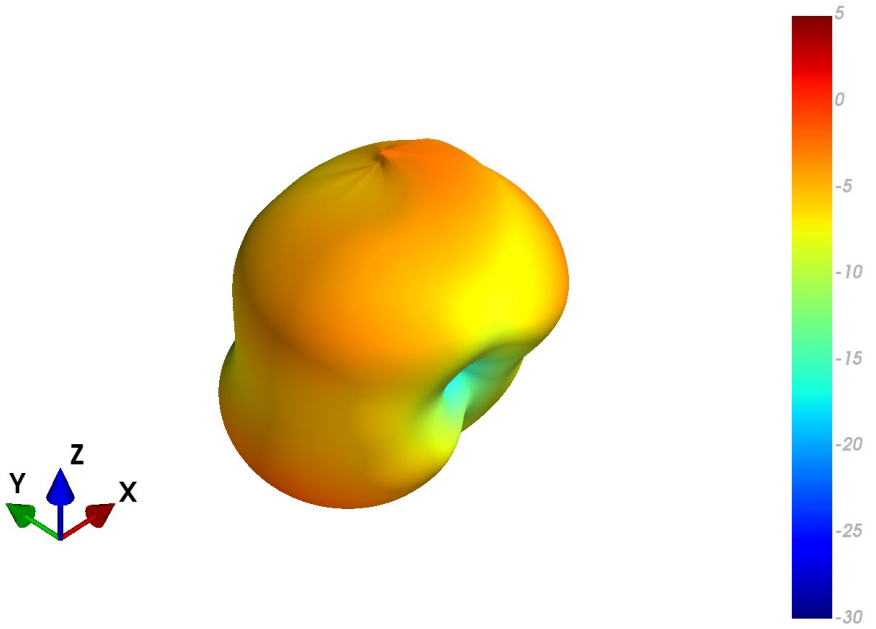
XZ Plane	YZ Plane	XY Plane
		

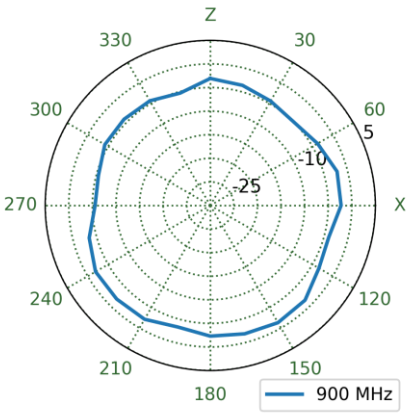
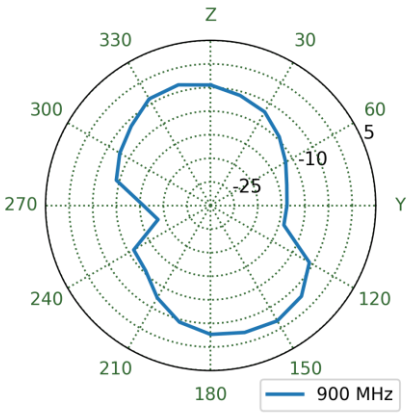
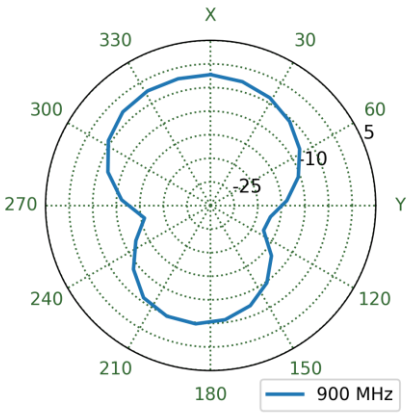
7.10 WW Patterns at 850 MHz



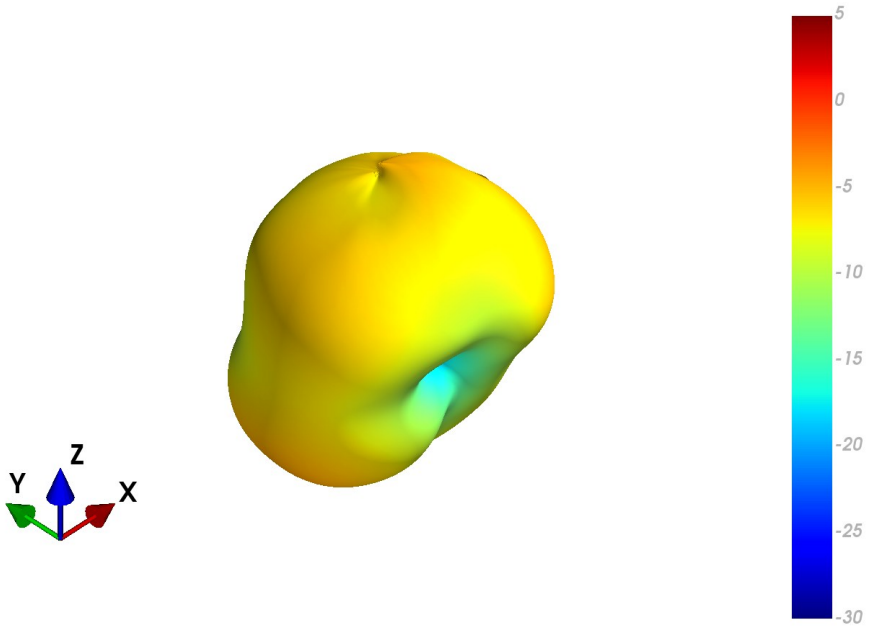
XZ Plane	YZ Plane	XY Plane
		

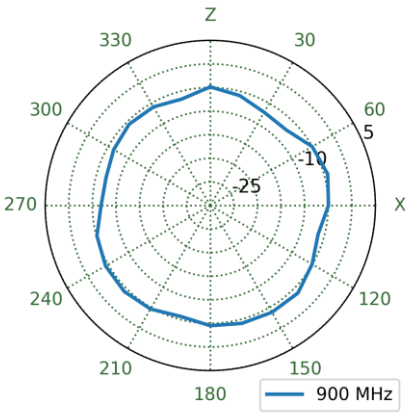
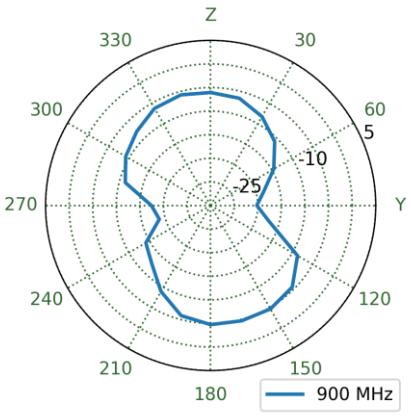
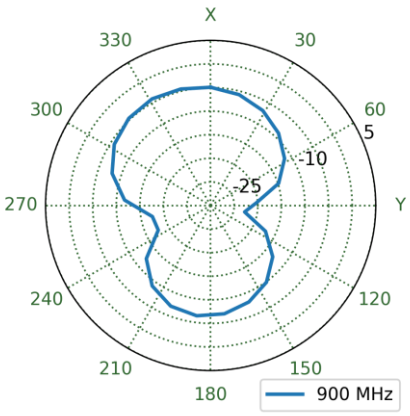
7.11 EMEA Patterns at 900 MHz



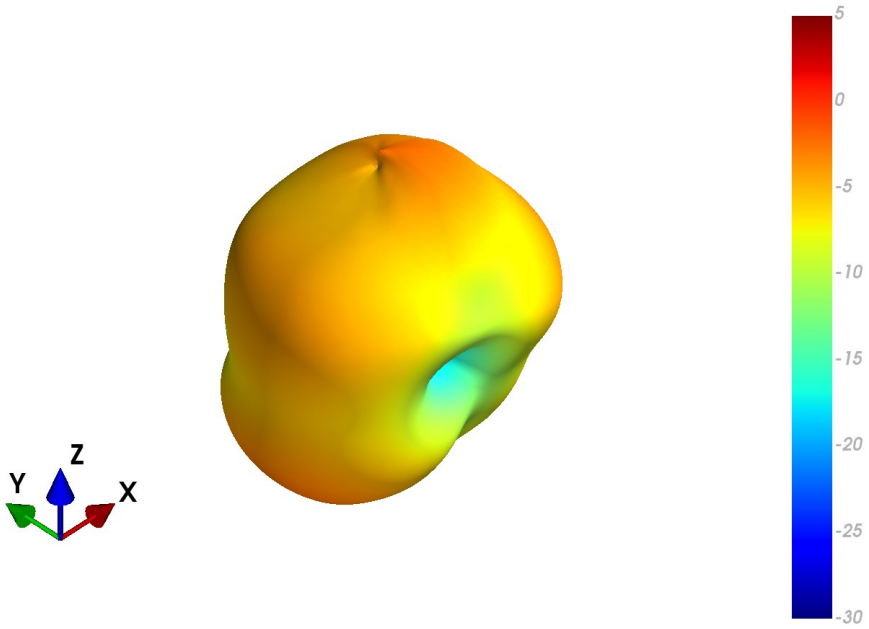
XZ Plane	YZ Plane	XY Plane
		

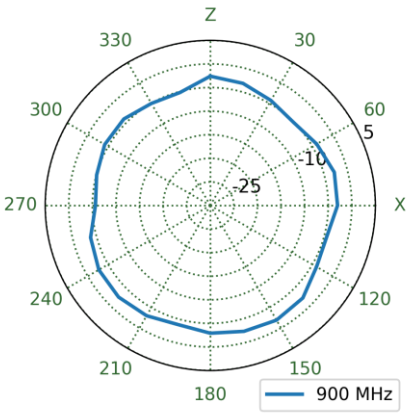
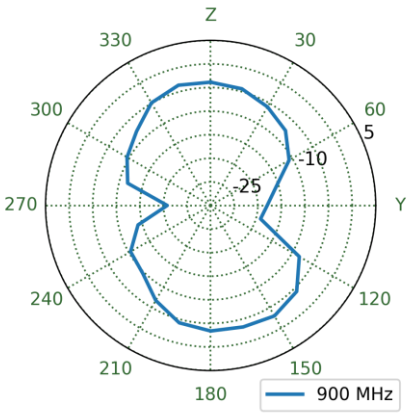
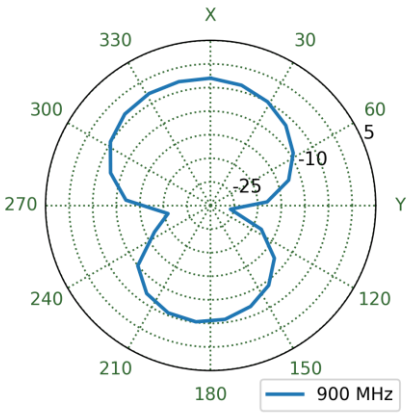
7.12 NA Patterns at 900 MHz



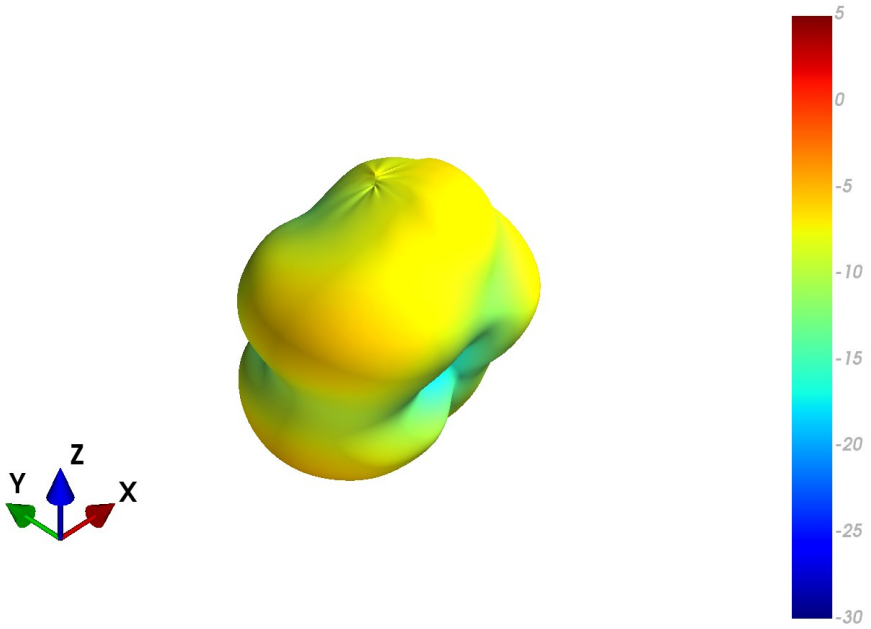
XZ Plane	YZ Plane	XY Plane
		

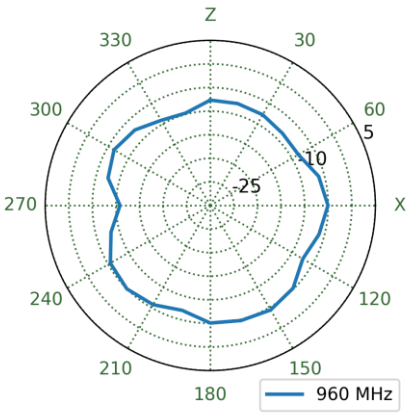
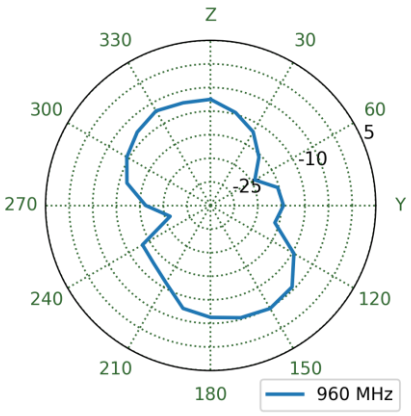
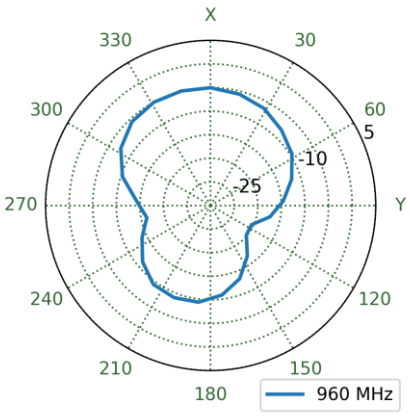
7.13 WW Patterns at 900 MHz



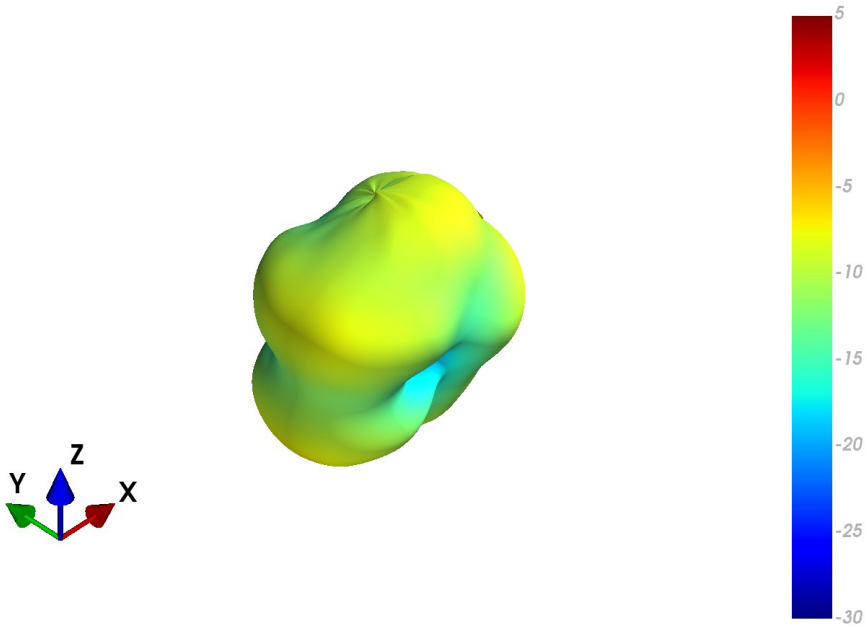
XZ Plane	YZ Plane	XY Plane
		

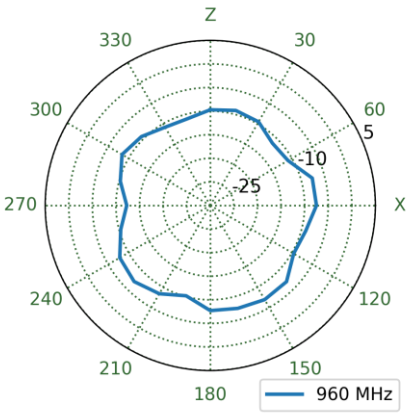
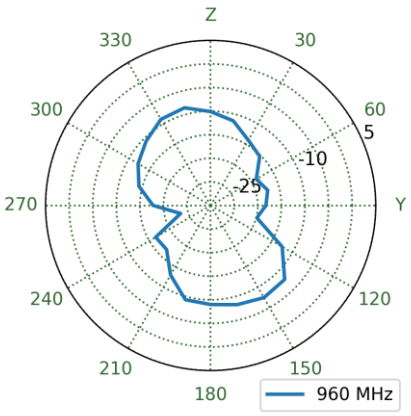
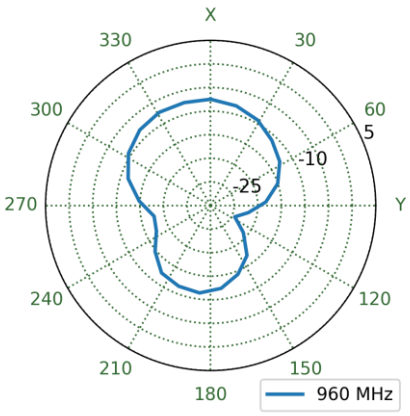
7.14 EMEA Patterns at 960 MHz



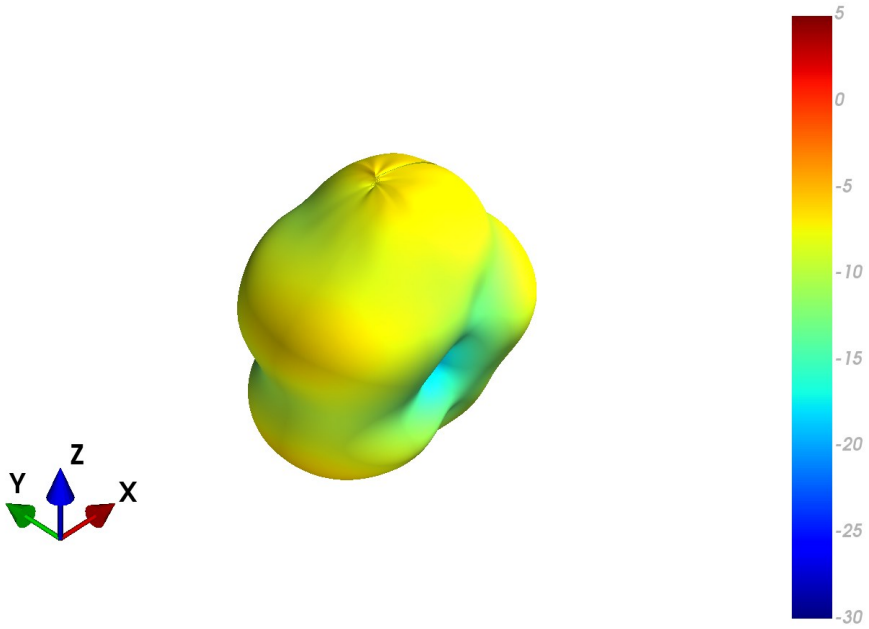
XZ Plane	YZ Plane	XY Plane
		

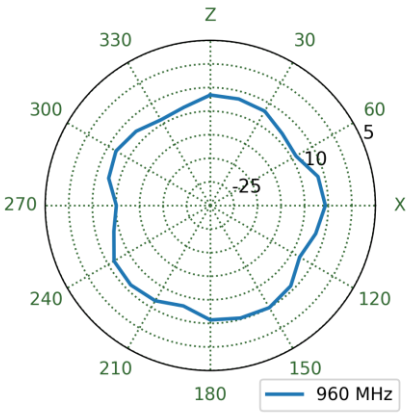
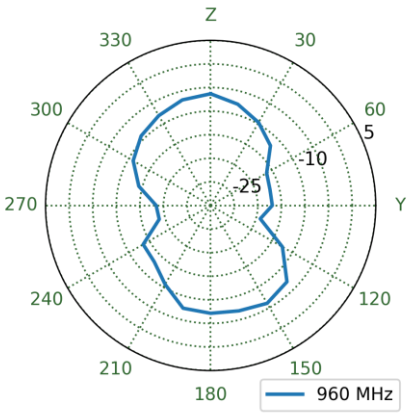
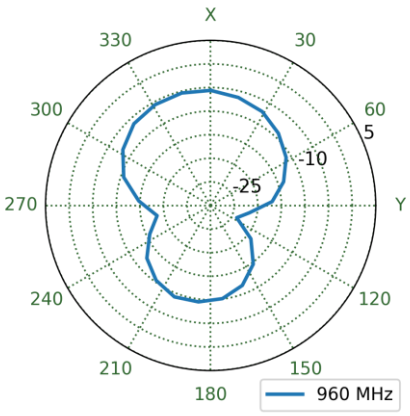
7.15 NA Patterns at 960 MHz



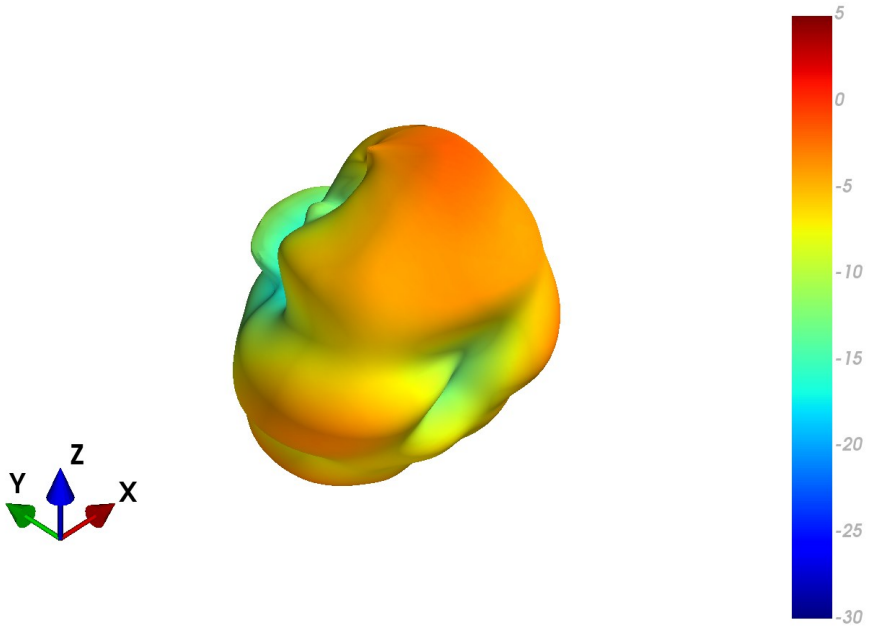
XZ Plane	YZ Plane	XY Plane
		

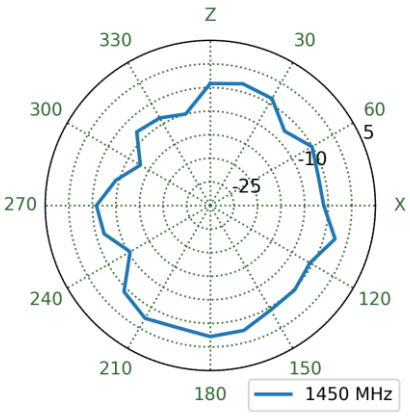
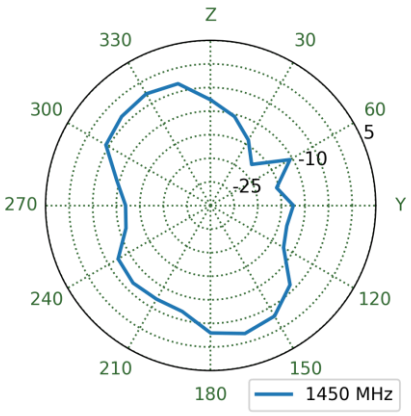
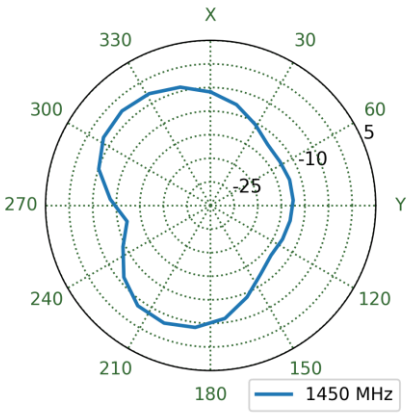
7.16 WW Patterns at 960 MHz



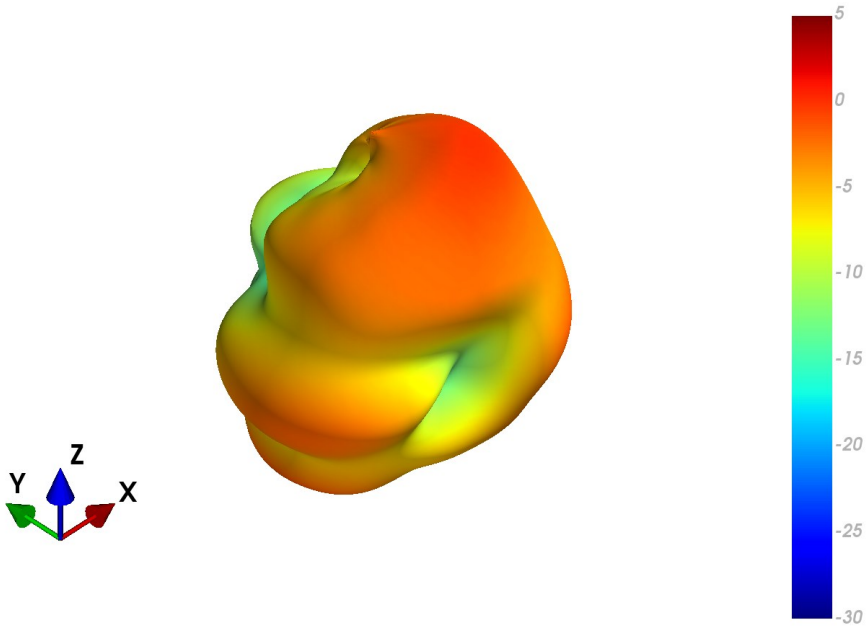
XZ Plane	YZ Plane	XY Plane
		

7.17 EMEA Patterns at 1450 MHz

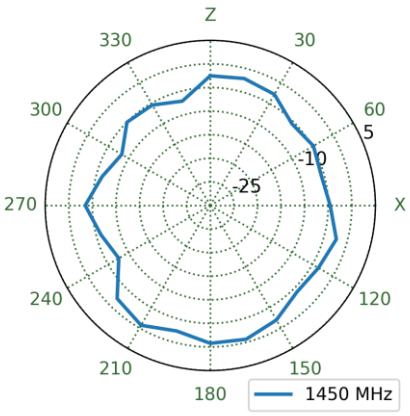


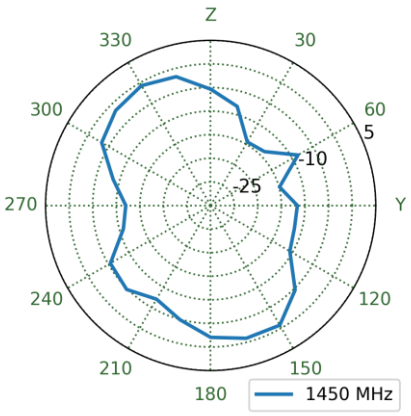
XZ Plane	YZ Plane	XY Plane
		

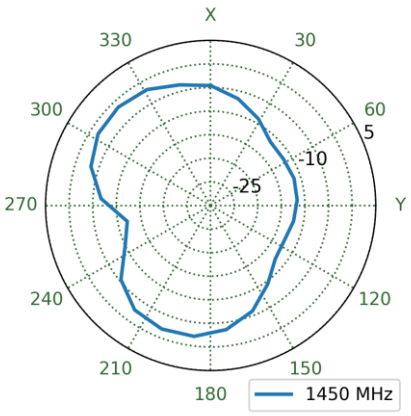
7.18 NA Patterns at 1450 MHz



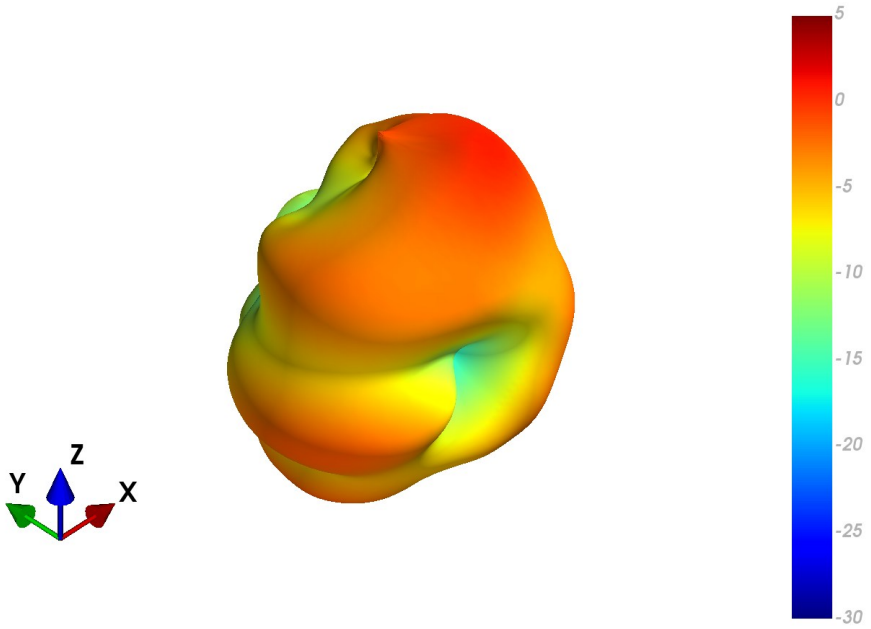
XZ Plane	YZ Plane	XY Plane

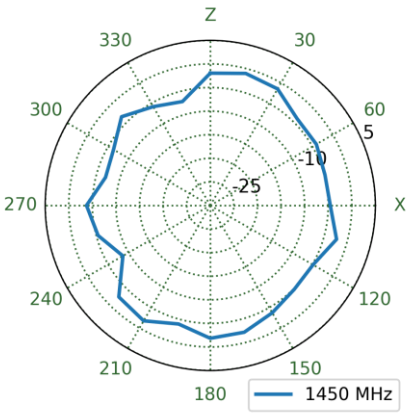
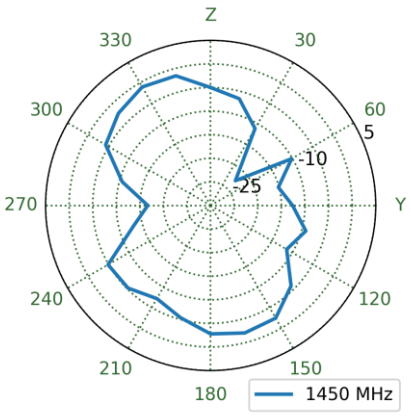
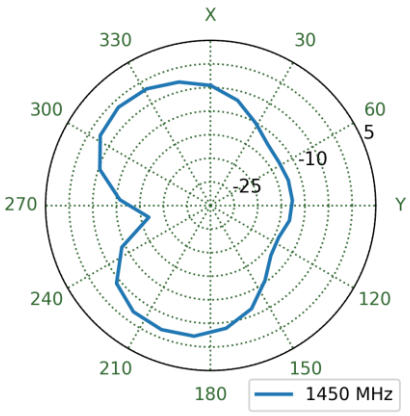




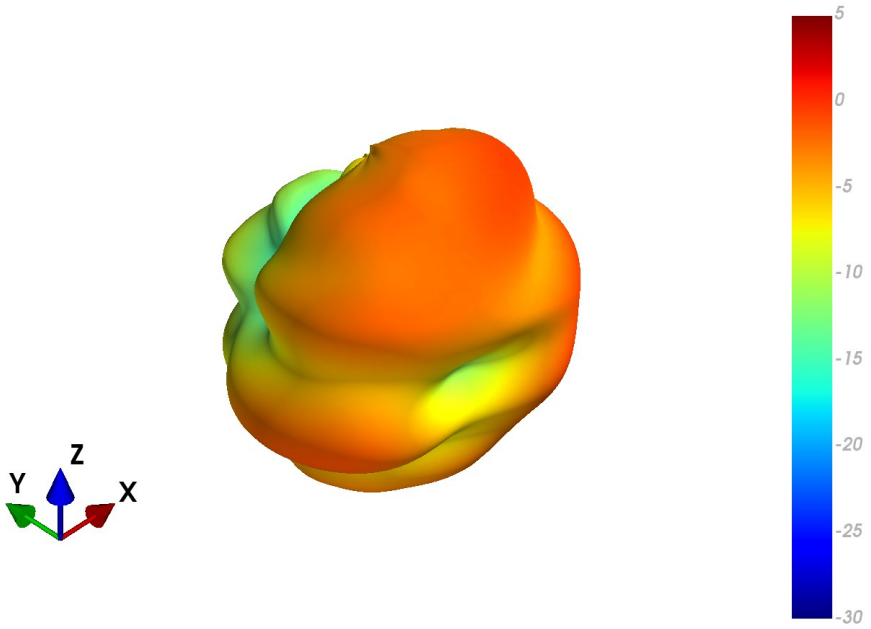


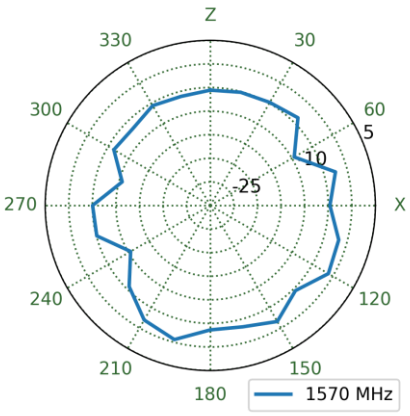
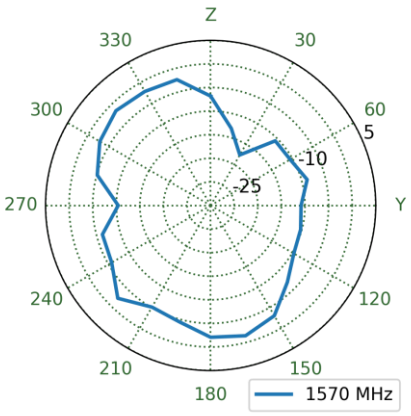
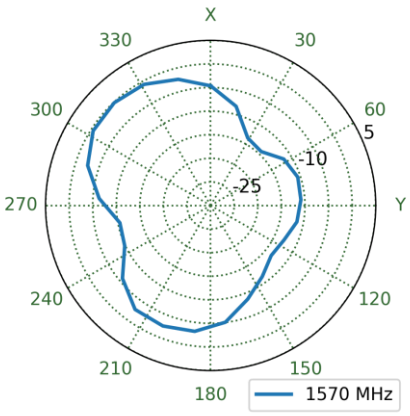
7.19 WW Patterns at 1450 MHz



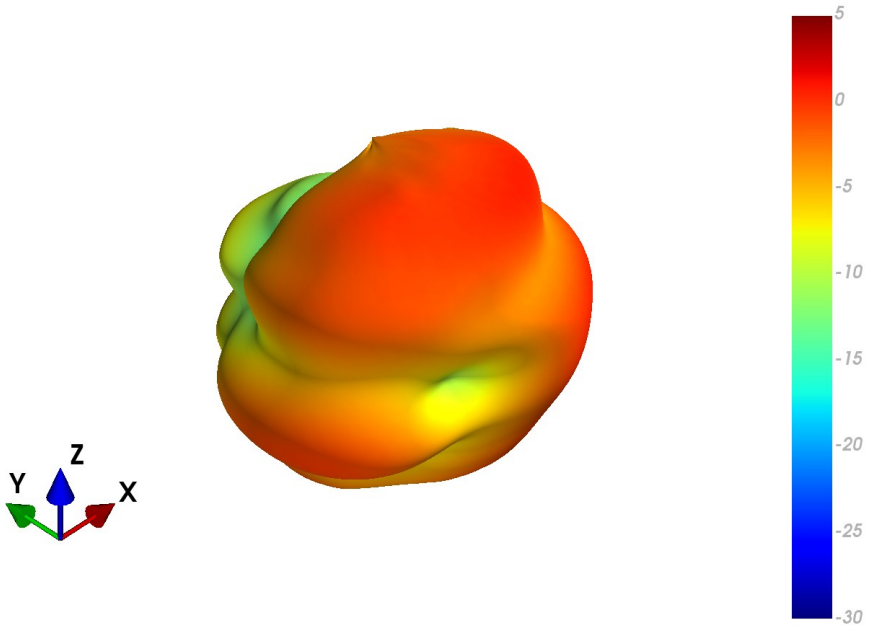
XZ Plane	YZ Plane	XY Plane
		

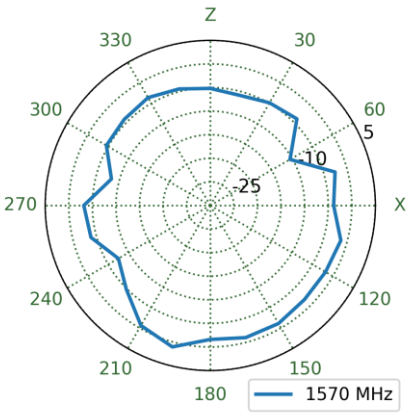
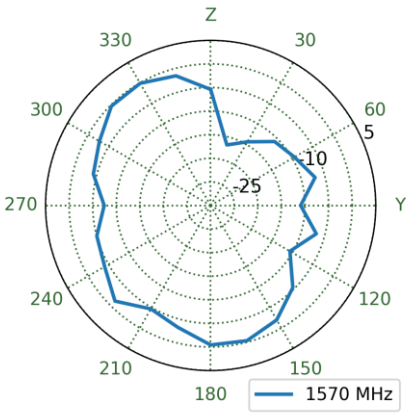
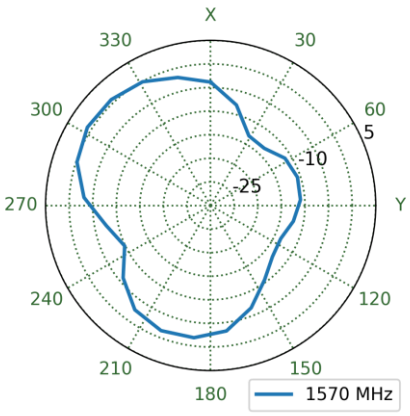
7.20 EMEA Patterns at 1575 MHz



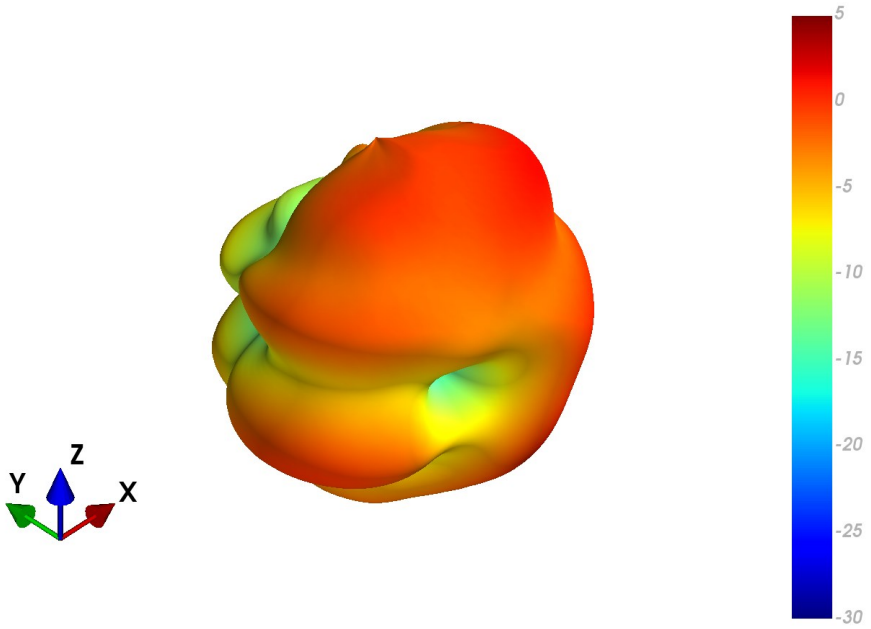
XZ Plane	YZ Plane	XY Plane
		

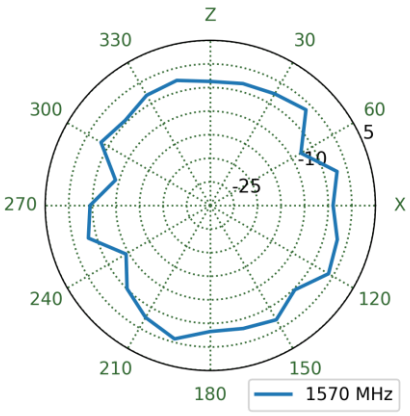
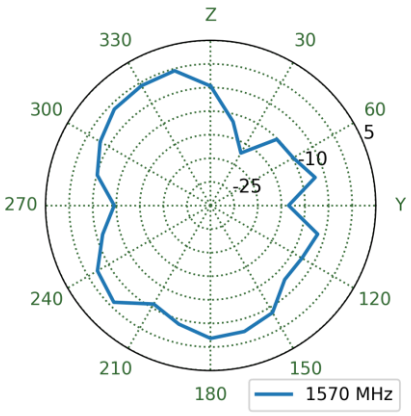
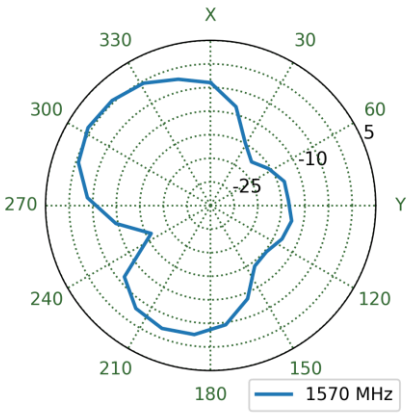
7.21 NA Patterns at 1575 MHz



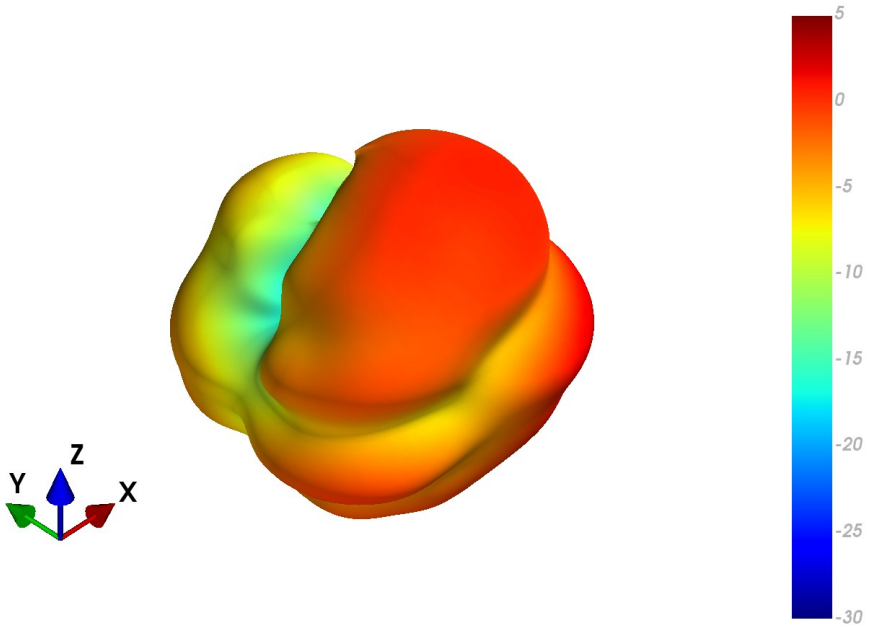
XZ Plane	YZ Plane	XY Plane
		

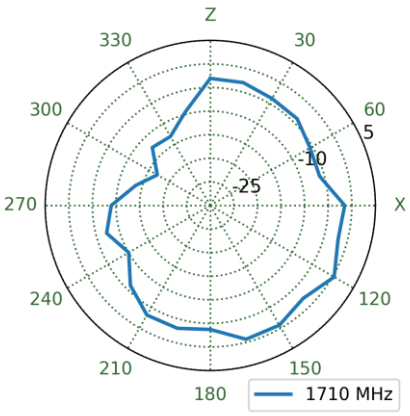
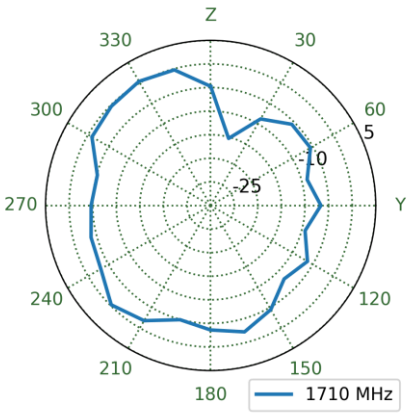
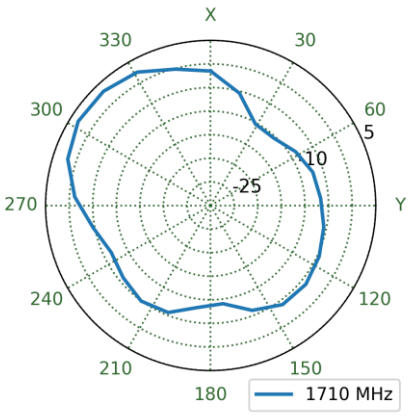
7.22 WW Patterns at 1575 MHz



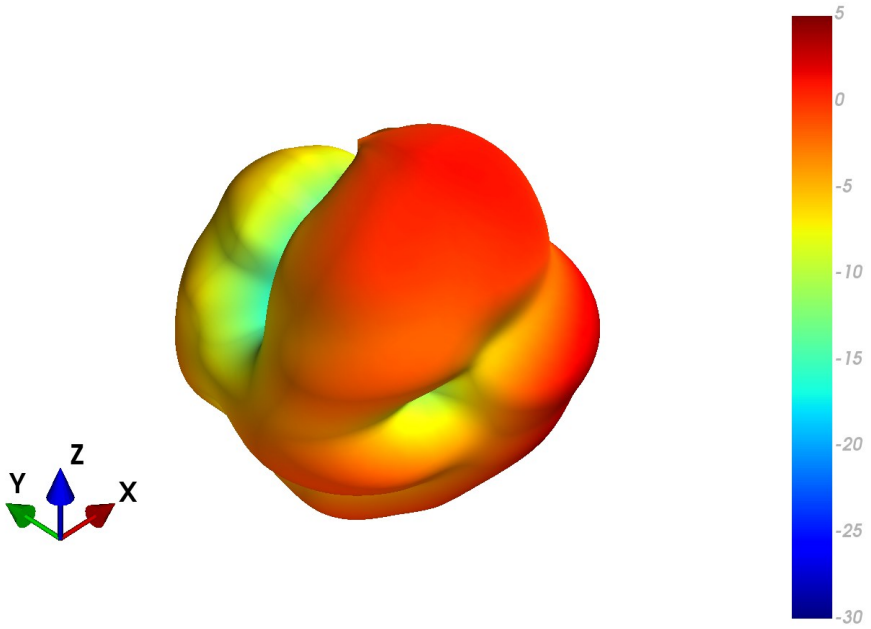
XZ Plane	YZ Plane	XY Plane
		

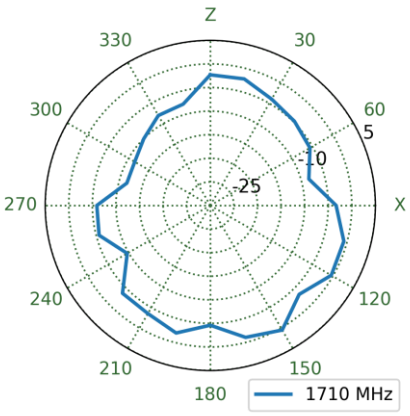
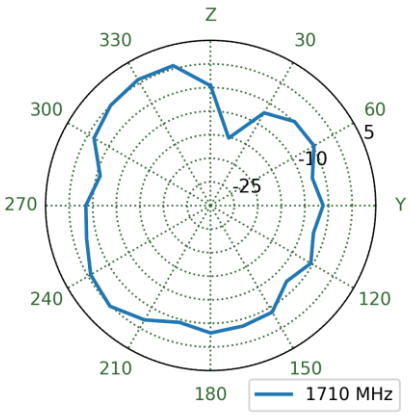
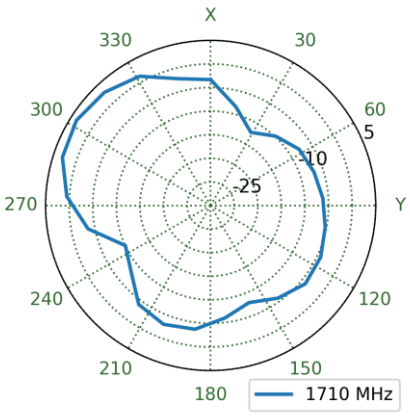
7.23 EMEA Patterns at 1710 MHz



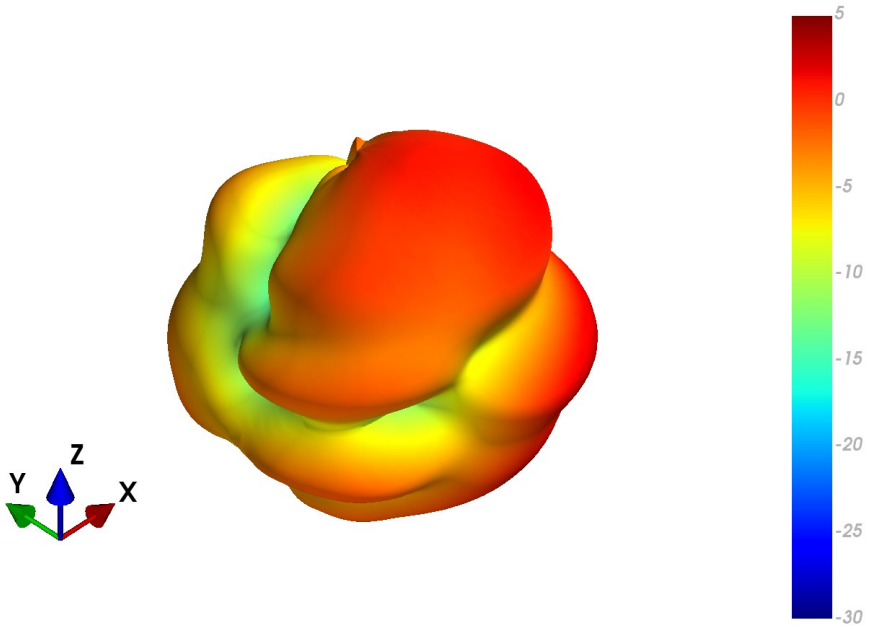
XZ Plane	YZ Plane	XY Plane
		

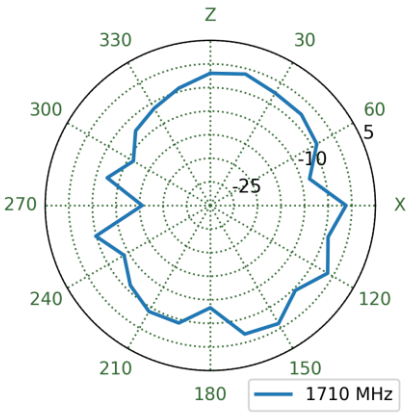
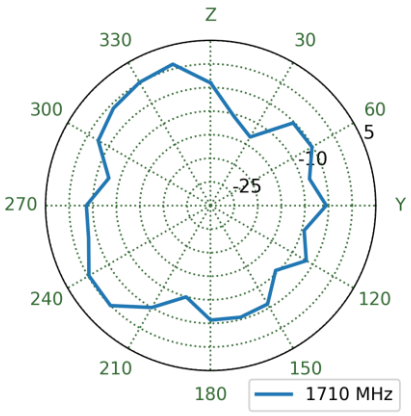
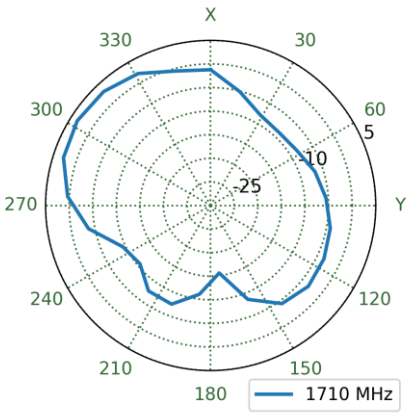
7.24 NA Patterns at 1710 MHz



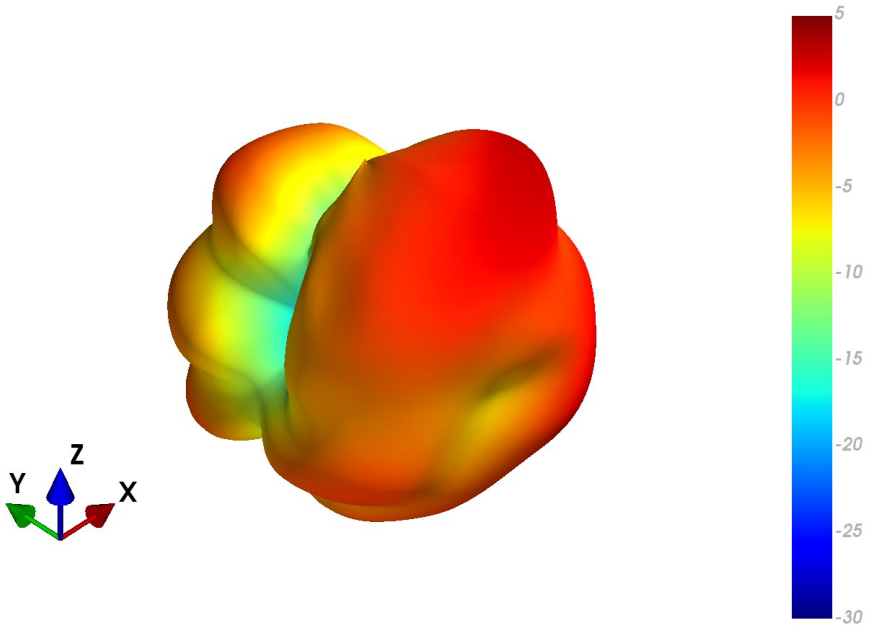
XZ Plane	YZ Plane	XY Plane
		

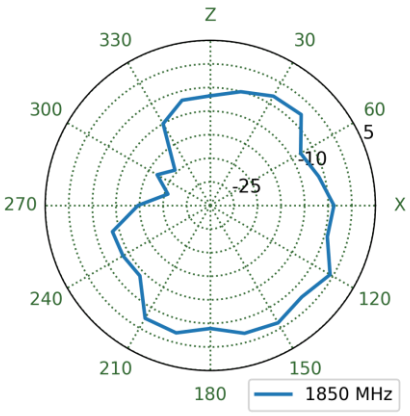
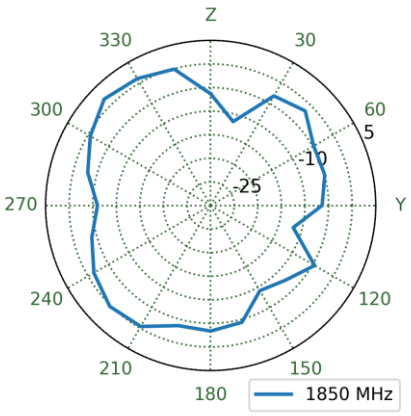
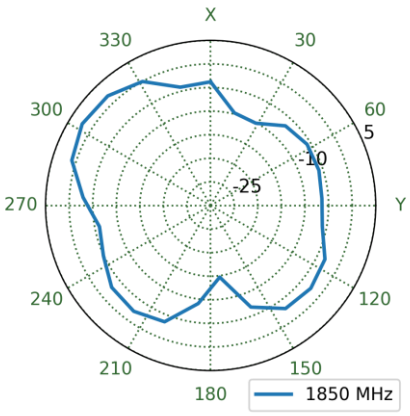
7.25 WW Patterns at 1710 MHz



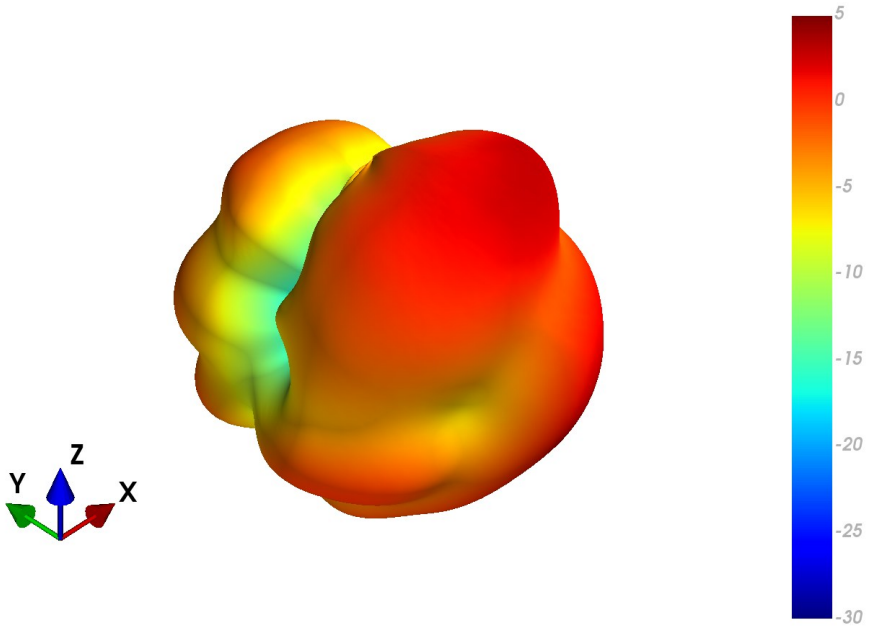
XZ Plane	YZ Plane	XY Plane
		

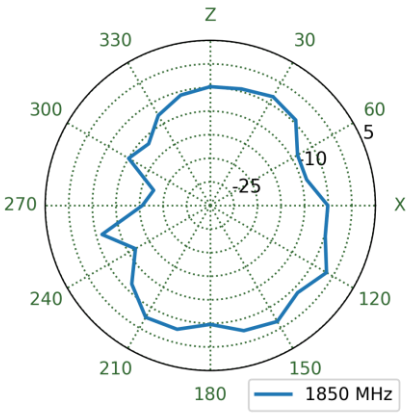
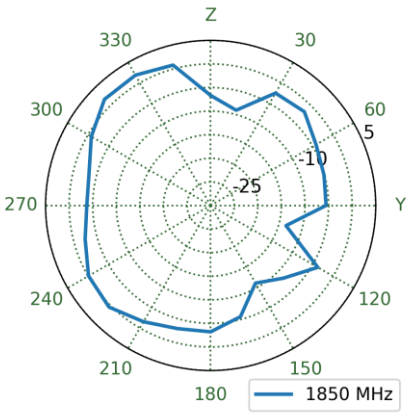
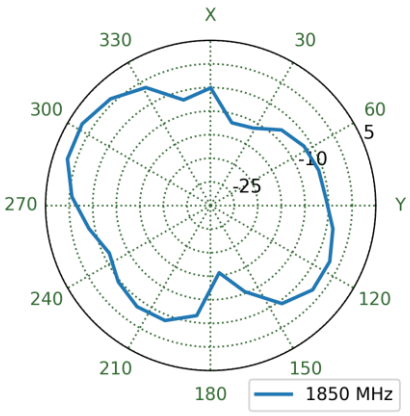
7.26 EMEA Patterns at 1850 MHz



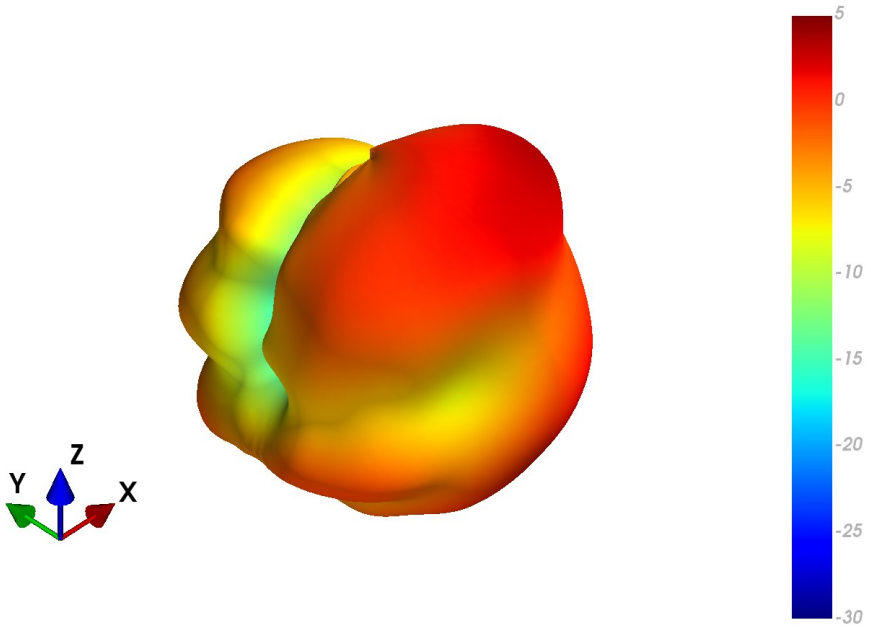
XZ Plane	YZ Plane	XY Plane
		

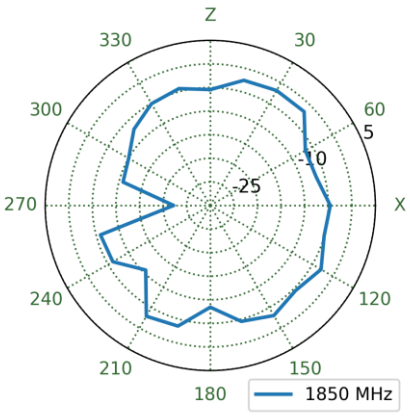
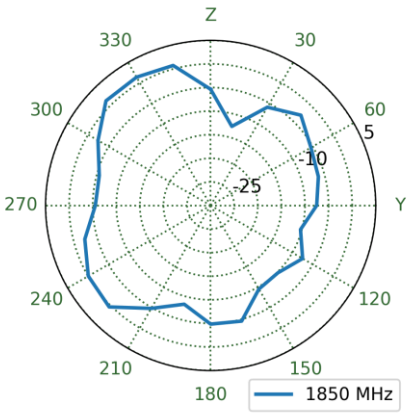
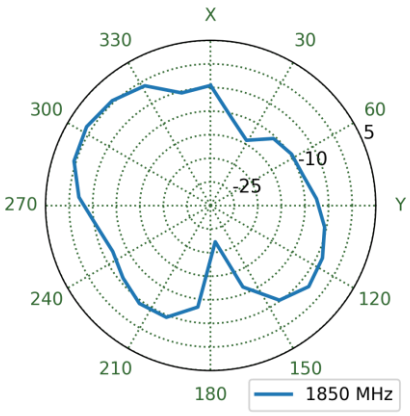
7.27 NA Patterns at 1850 MHz



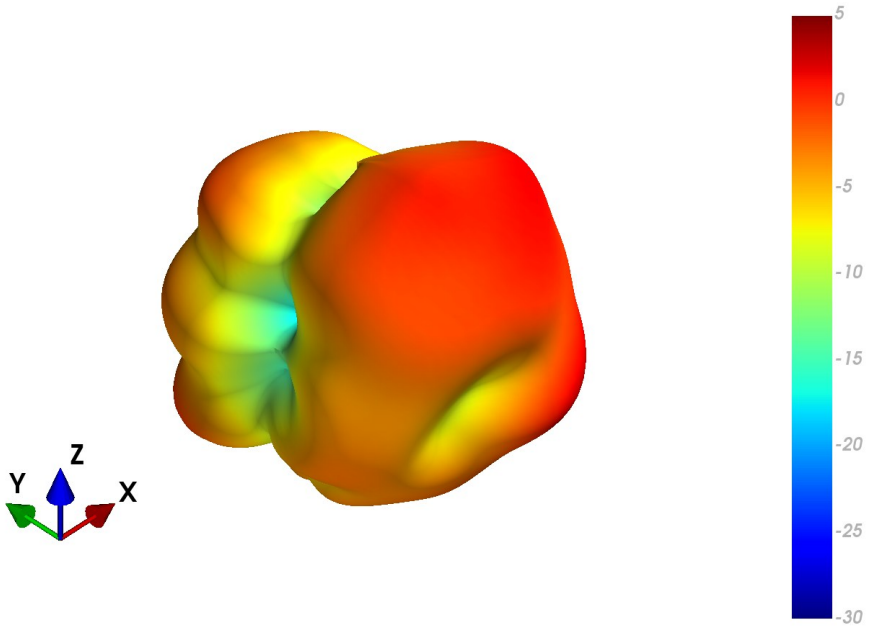
XZ Plane	YZ Plane	XY Plane
		

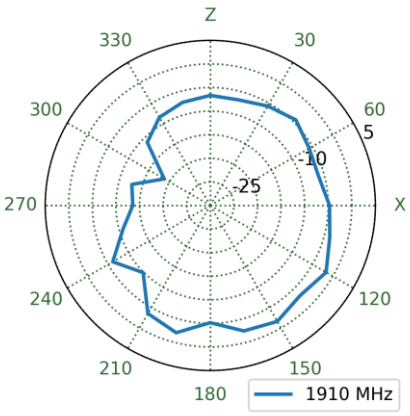
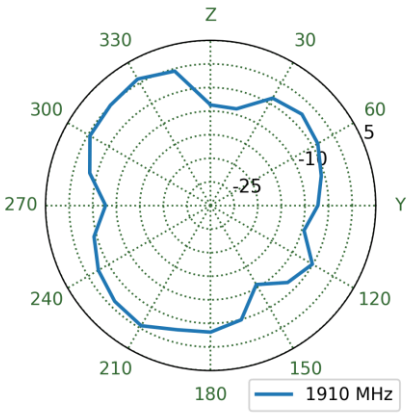
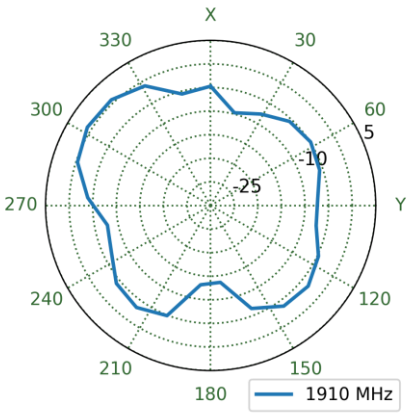
7.28 WW Patterns at 1850 MHz



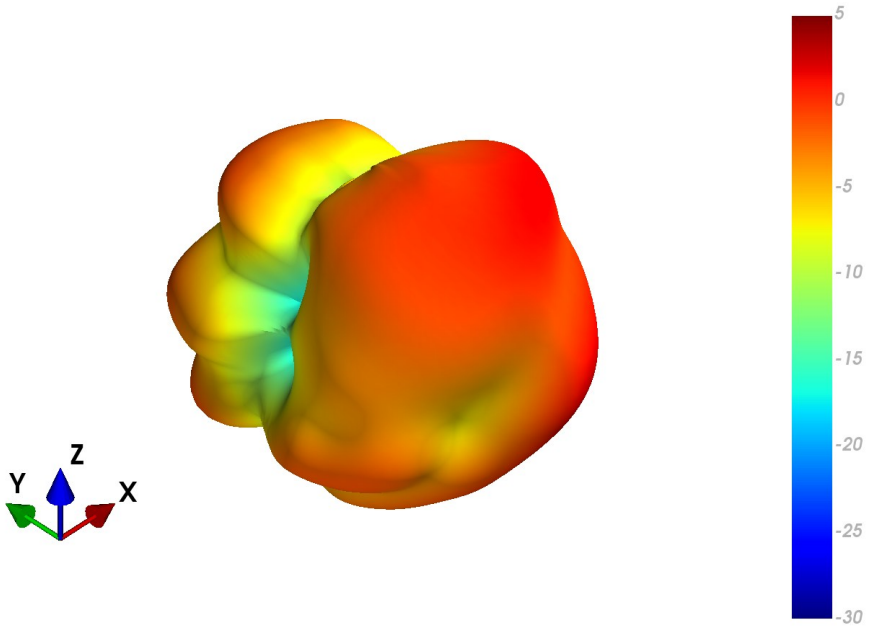
XZ Plane	YZ Plane	XY Plane
		

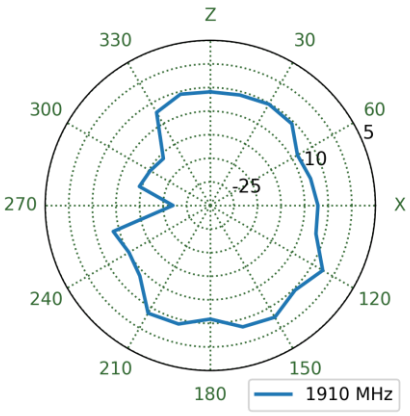
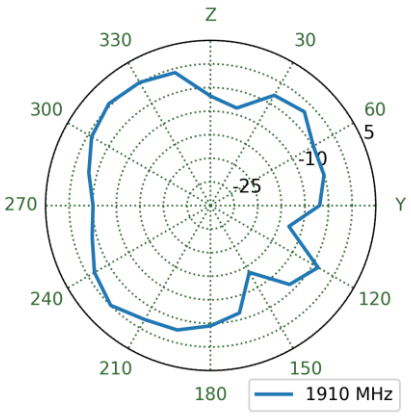
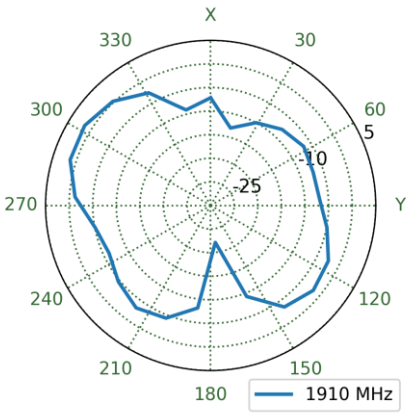
7.29 EMEA Patterns at 1910 MHz



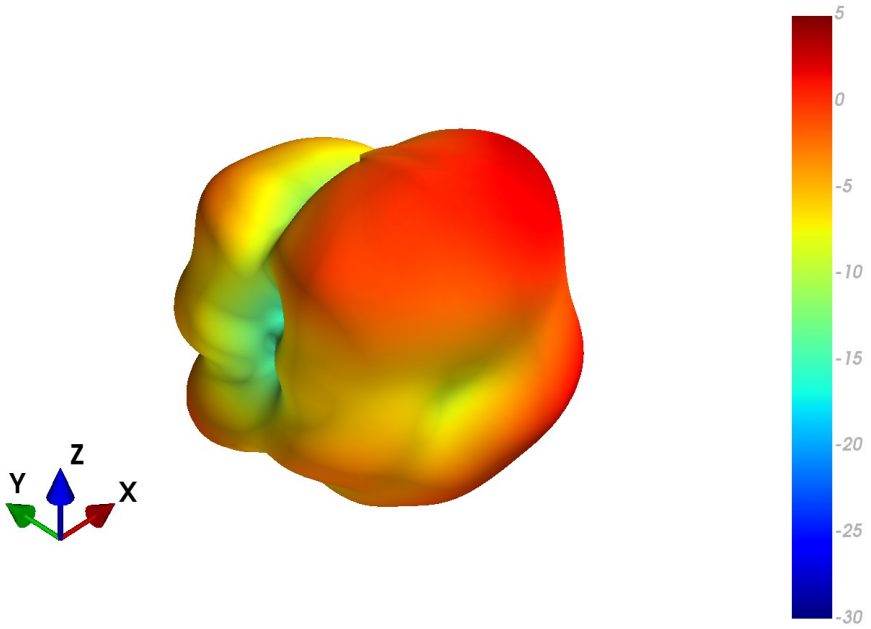
XZ Plane	YZ Plane	XY Plane
		

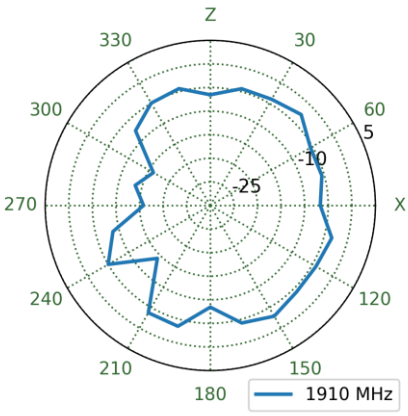
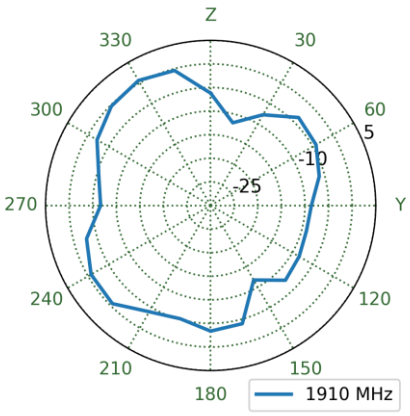
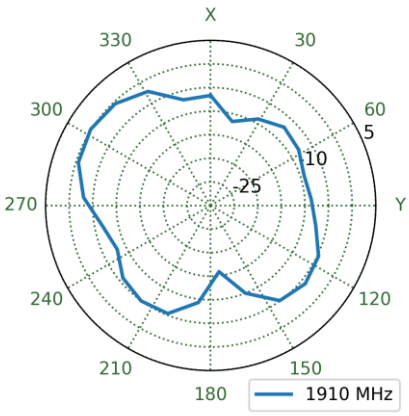
7.30 NA Patterns at 1910 MHz



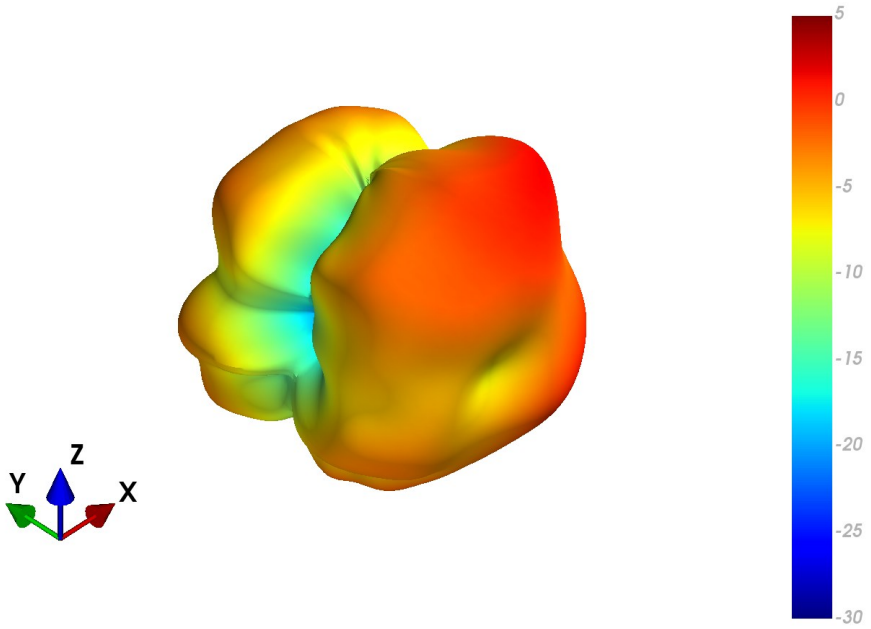
XZ Plane	YZ Plane	XY Plane
		

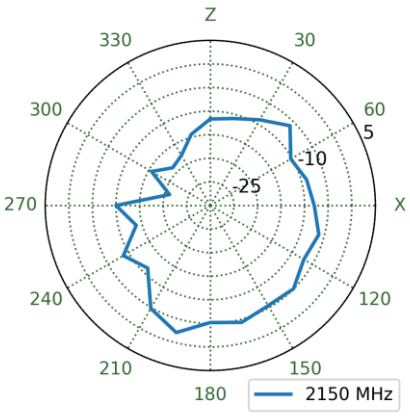
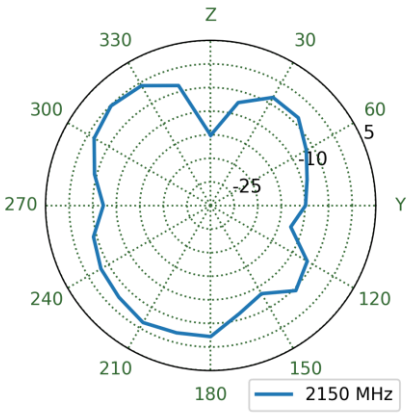
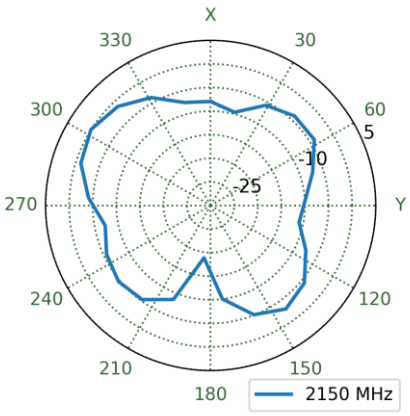
7.31 WW Patterns at 1910 MHz



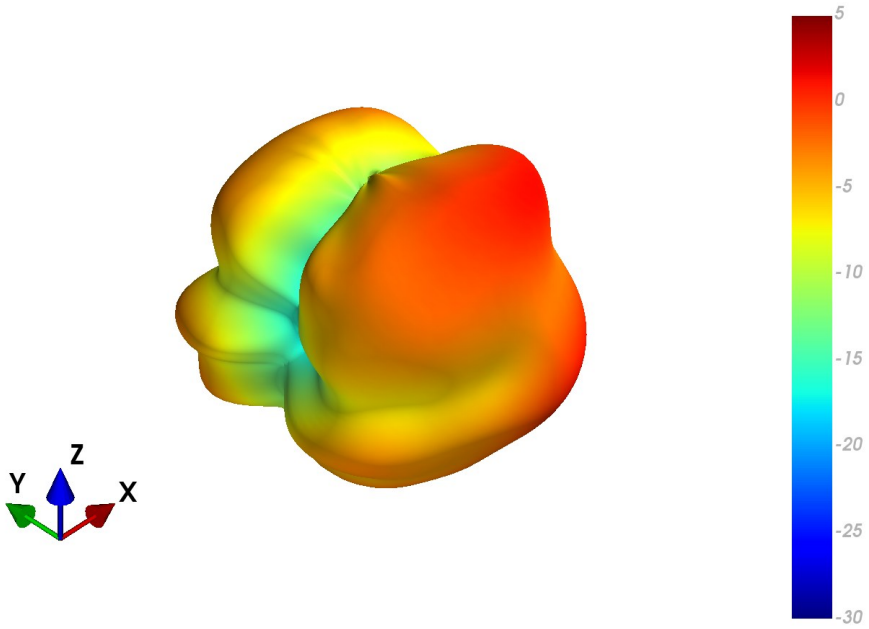
XZ Plane	YZ Plane	XY Plane
		

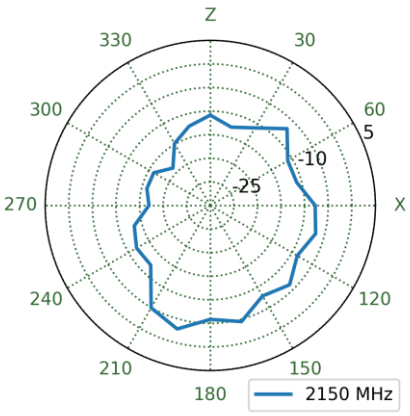
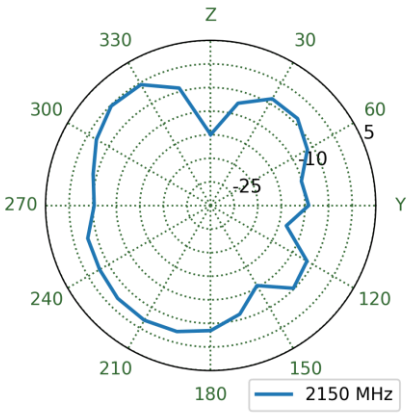
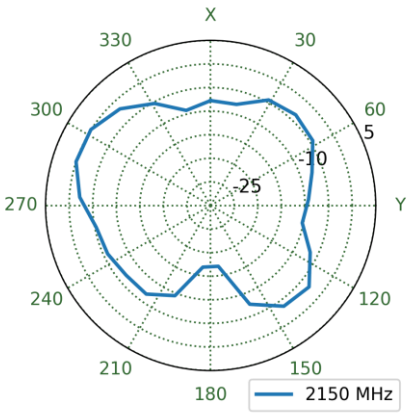
7.32 EMEA Patterns at 2155 MHz



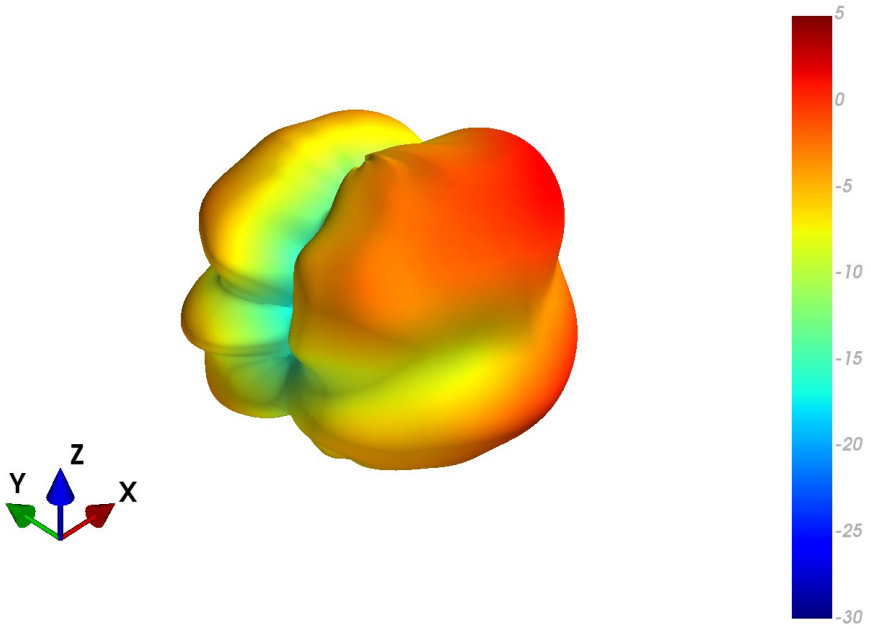
XZ Plane	YZ Plane	XY Plane
		

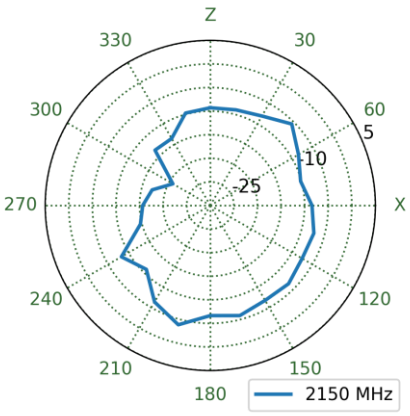
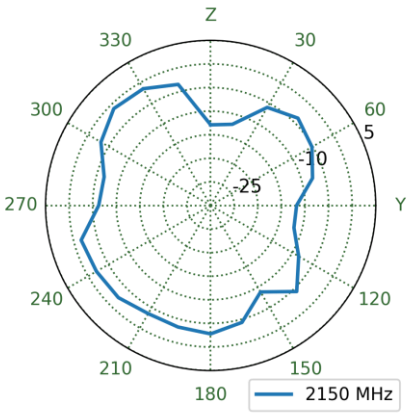
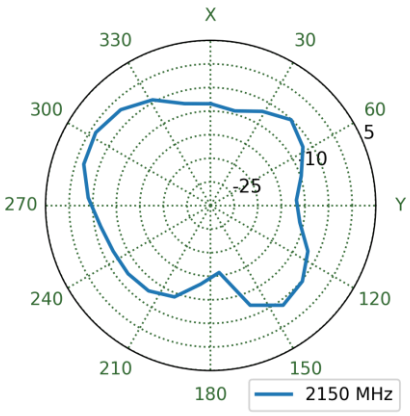
7.33 NA Patterns at 2155 MHz



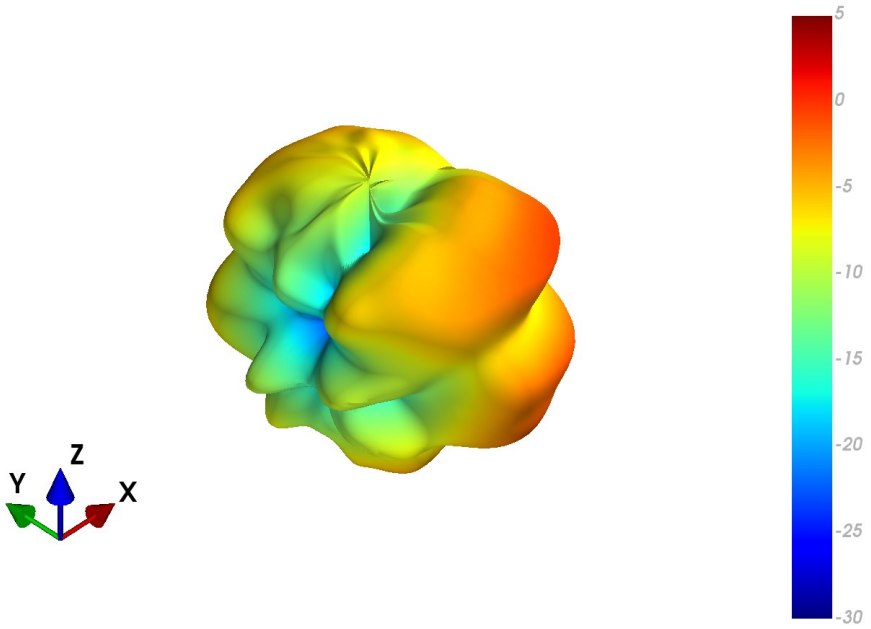
XZ Plane	YZ Plane	XY Plane
		

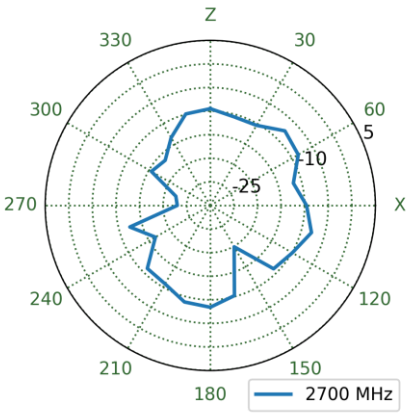
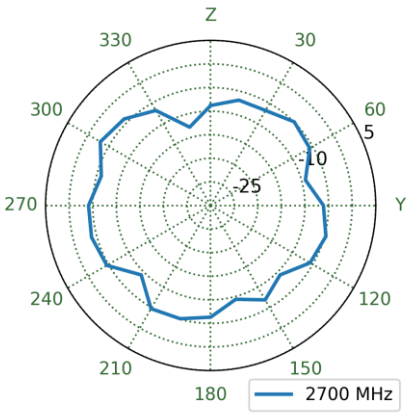
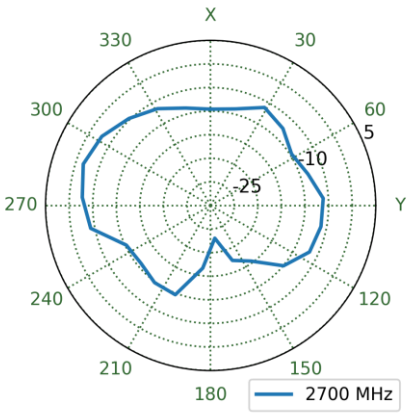
7.34 WW Patterns at 2155 MHz



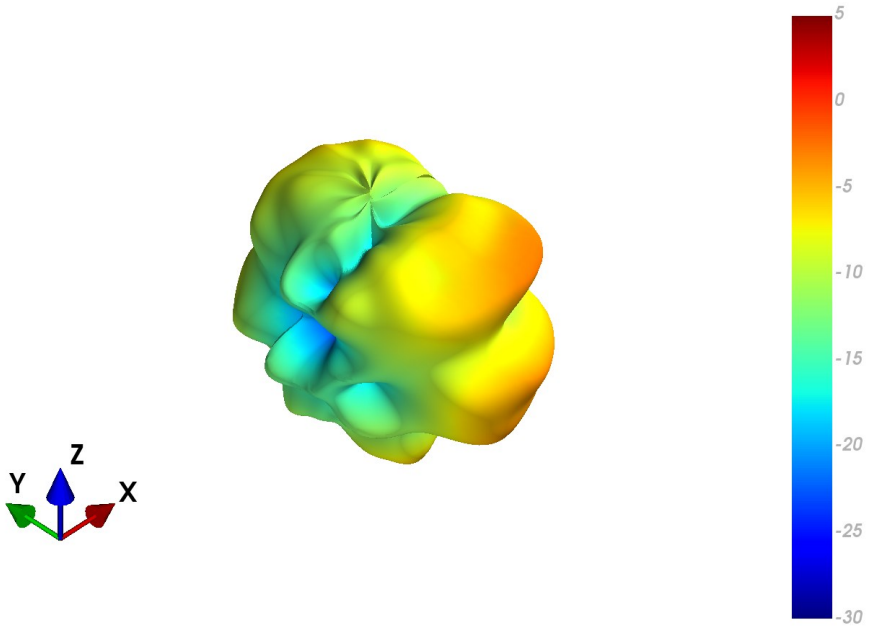
XZ Plane	YZ Plane	XY Plane
		

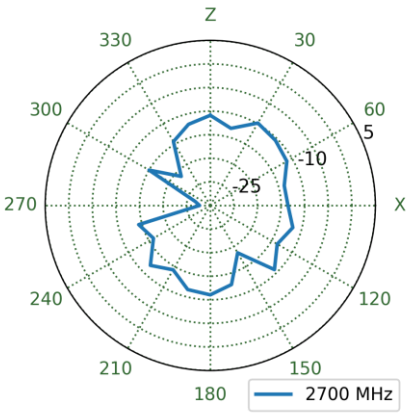
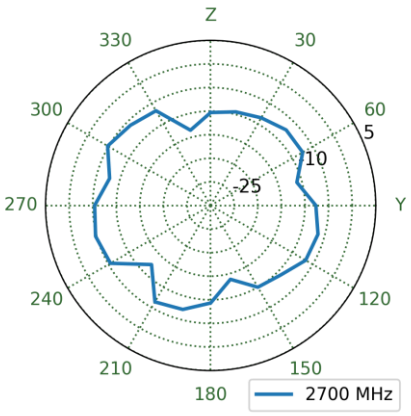
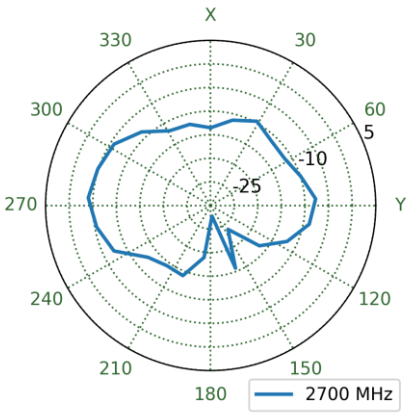
7.35 EMEA Patterns at 2700 MHz



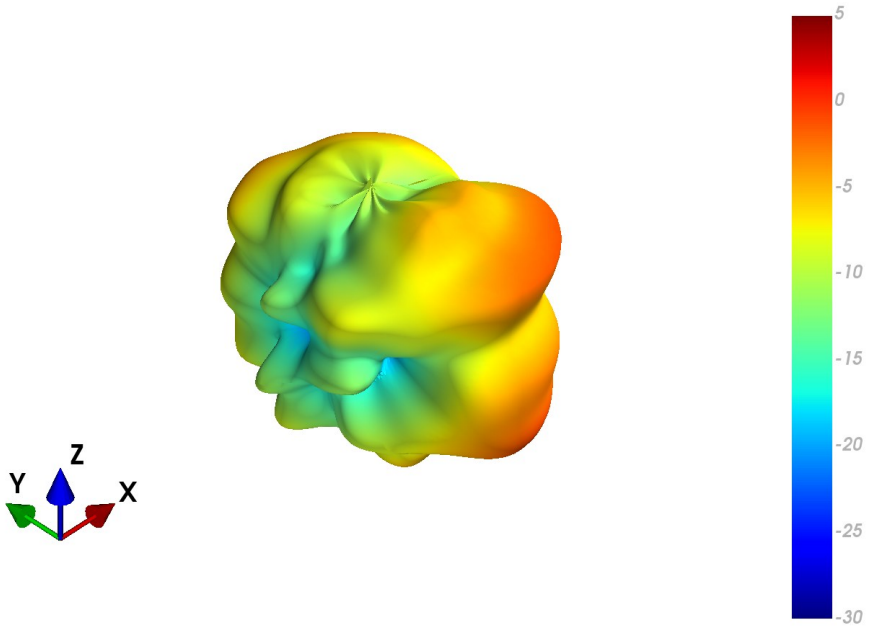
XZ Plane	YZ Plane	XY Plane
		

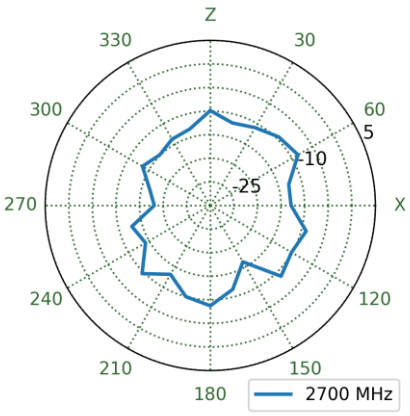
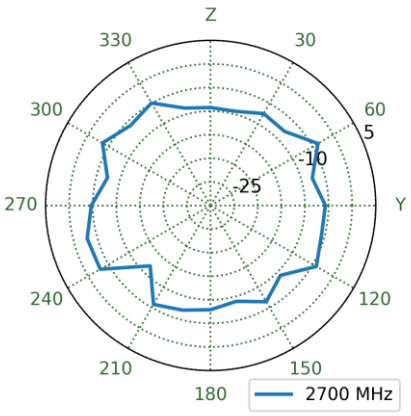
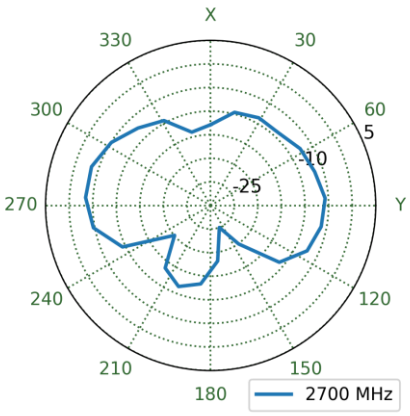
7.36 NA Patterns at 2700 MHz



XZ Plane	YZ Plane	XY Plane
		

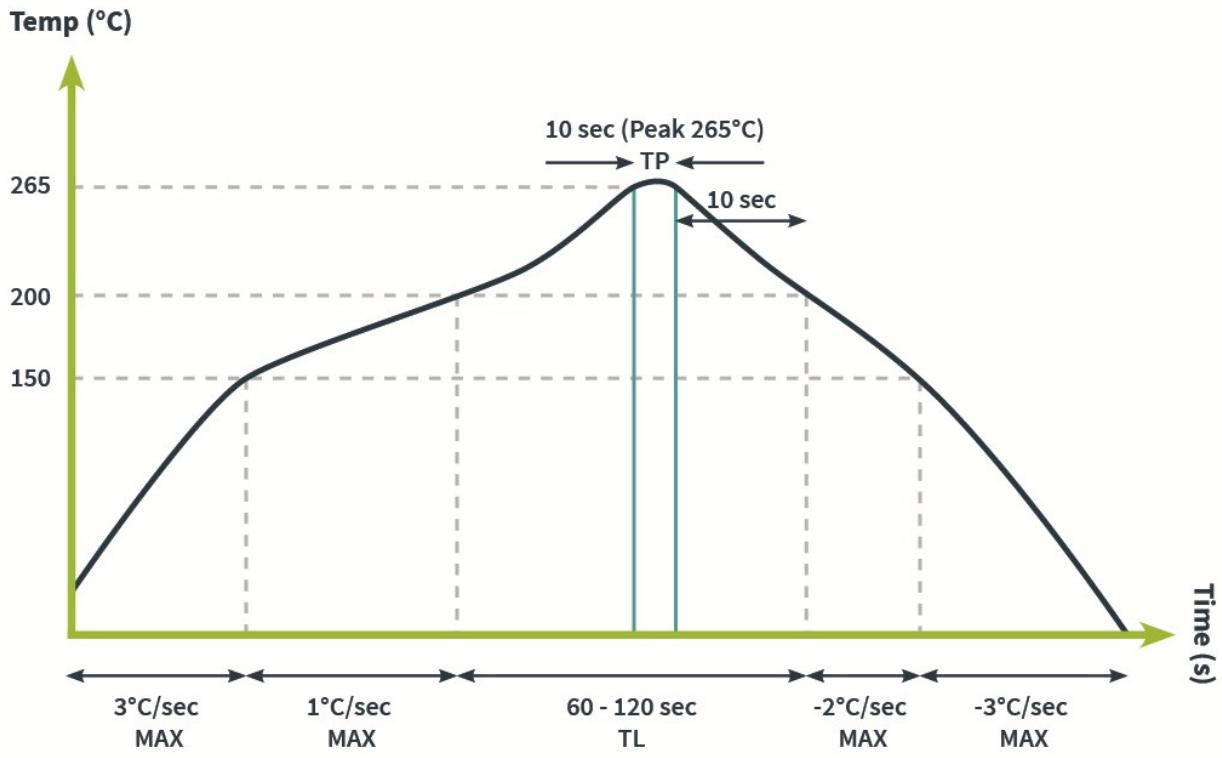
7.37 WW Patterns at 2700 MHz



XZ Plane	YZ Plane	XY Plane
		

8. Solder Reflow Profile

The PCS.55.M can be assembled by following the recommended soldering temperatures are as follows:



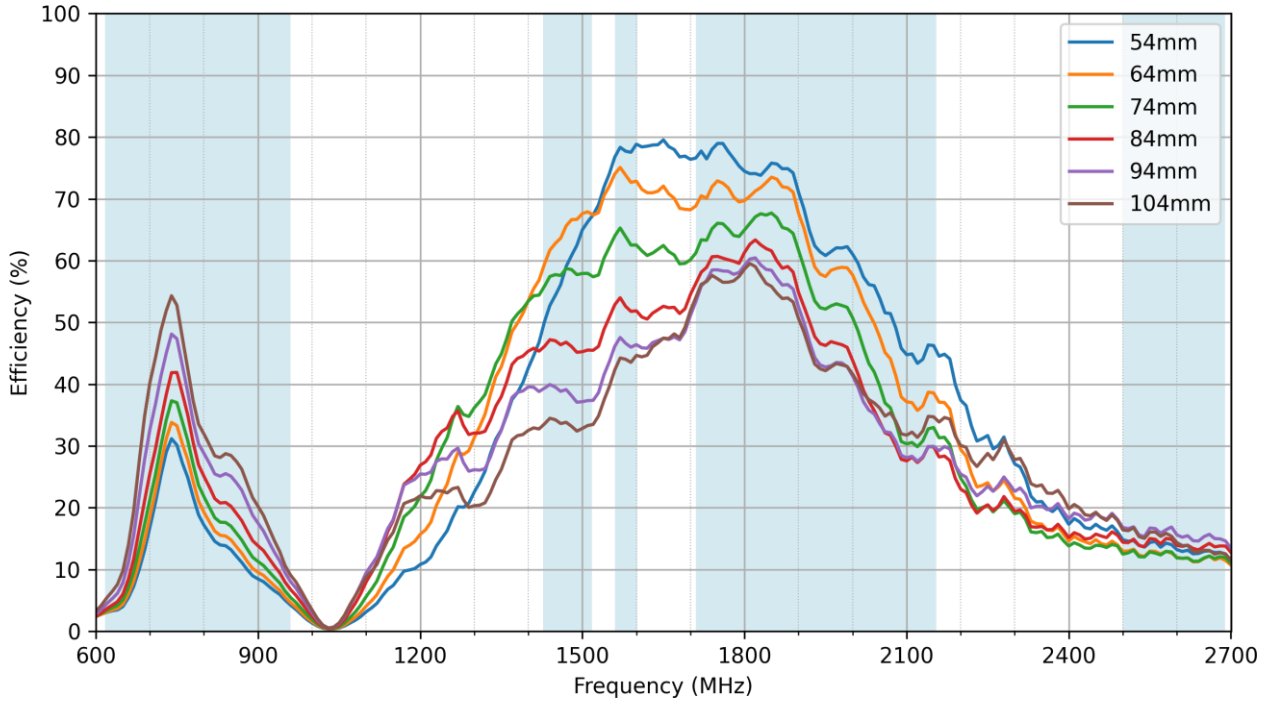
*Temperatures listed within a tolerance of +/- 10º C

The PCS.55.M is not limited to the number of passes through the reflow process. Smaller components are typically mounted on the first pass, however, we do advise mounting the PCS.55.M when placing larger components on the board during subsequent reflows.

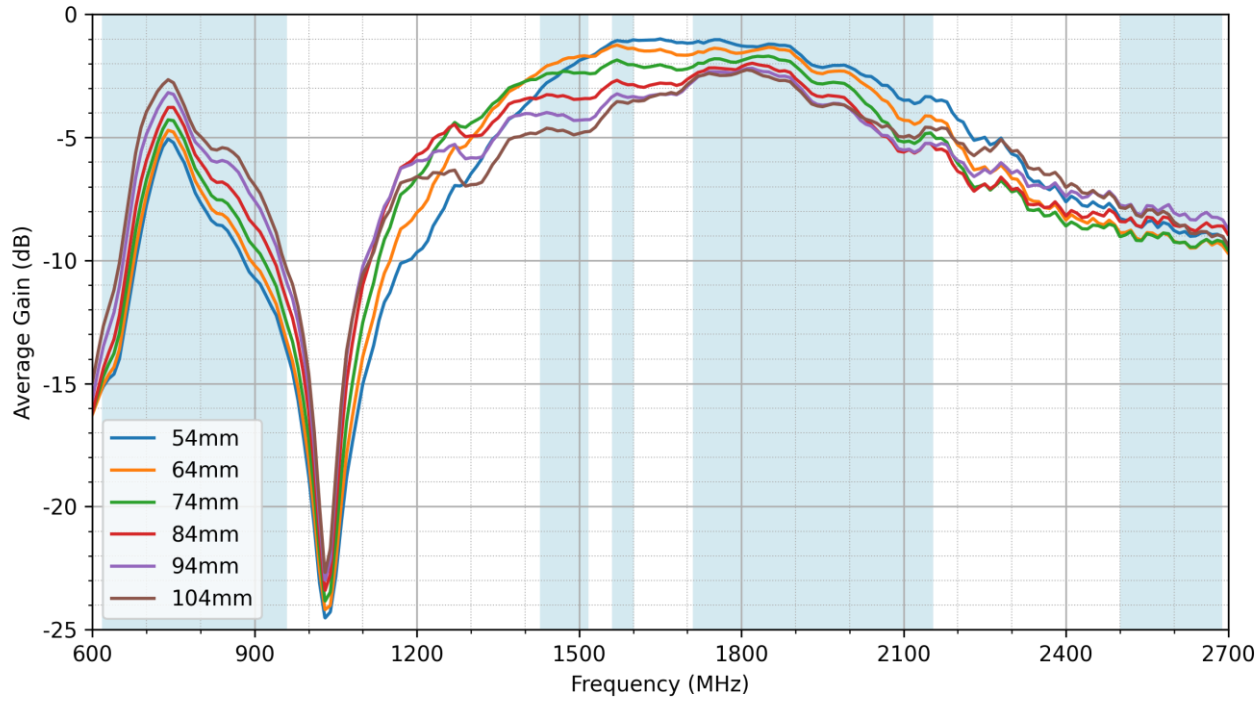
9. Application Note

The effect of shortening the ground plane on antenna performance was evaluated. Using the evaluation board of the PCS.55.M, the PCB was cut back 10mm at a time and tested in an anechoic chamber. The results for North America (NA), Europe, Middle East, Africa (EMEA), and Worldwide (WW) are shown here:

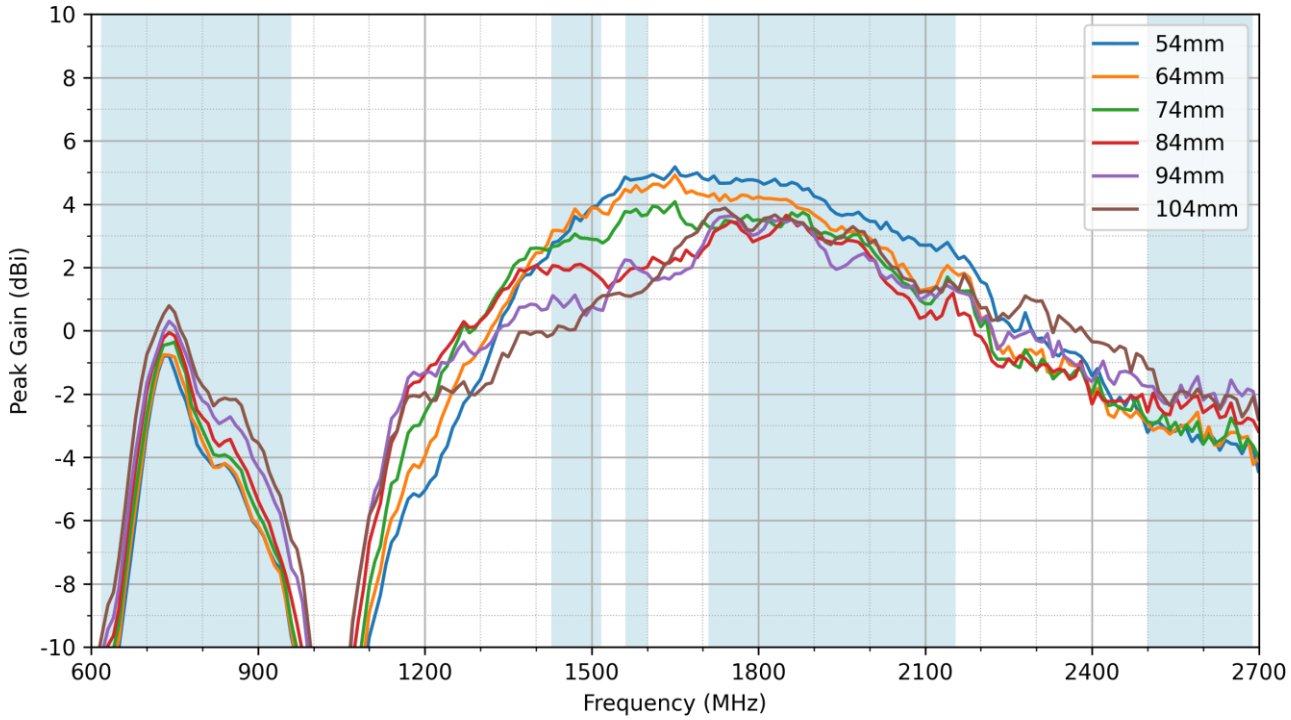
9.1 Efficiency – North America



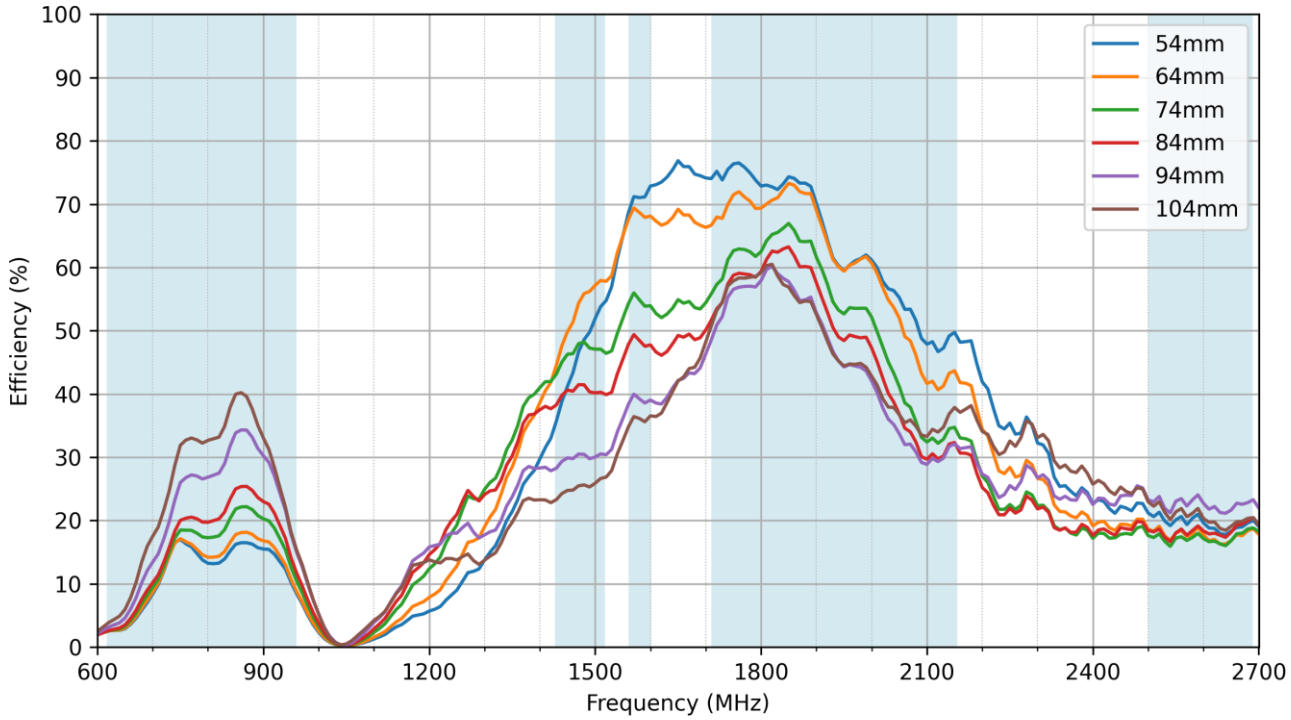
9.2 Average Gain – North America



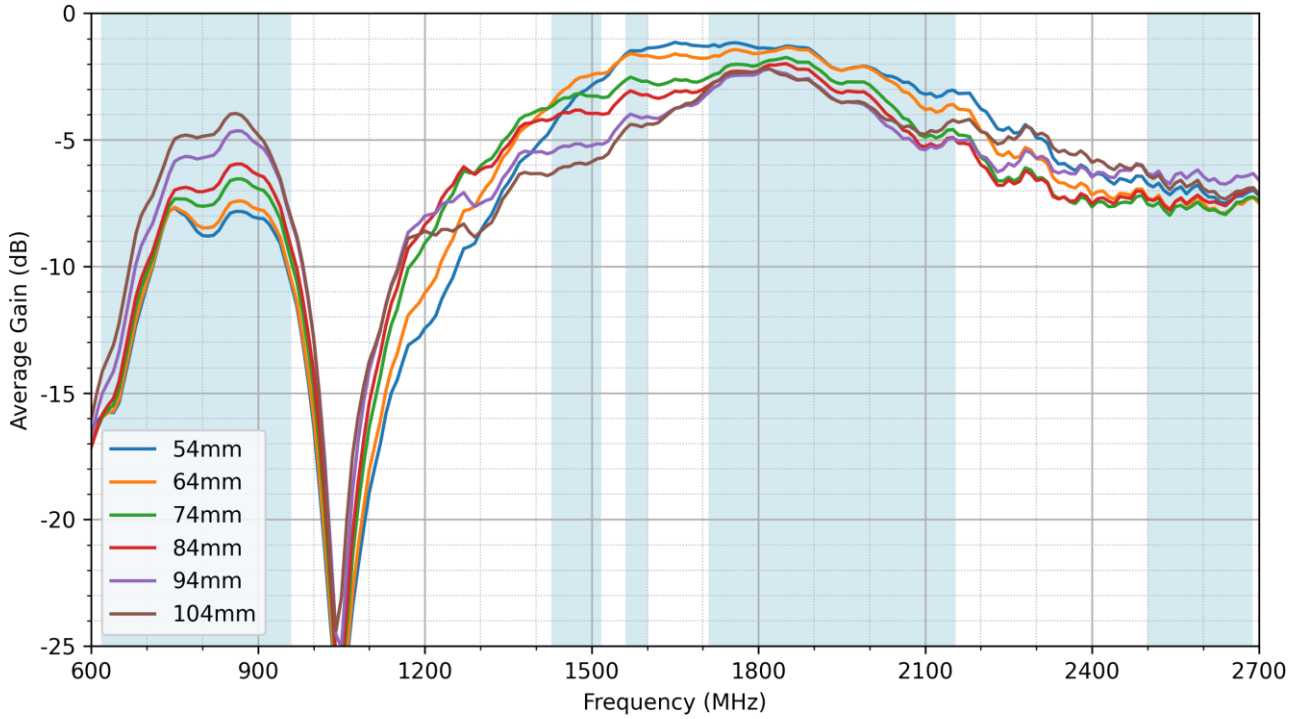
9.3 Peak Gain – North America



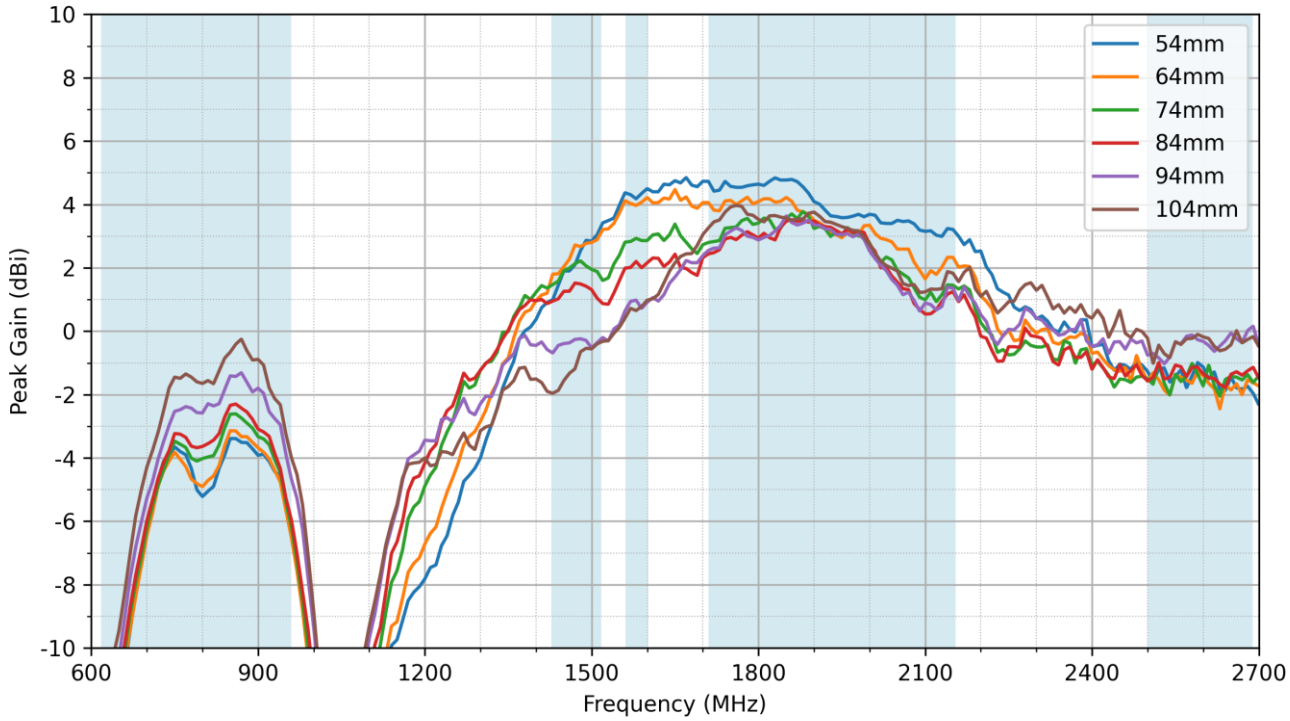
9.4 Efficiency – EMEA



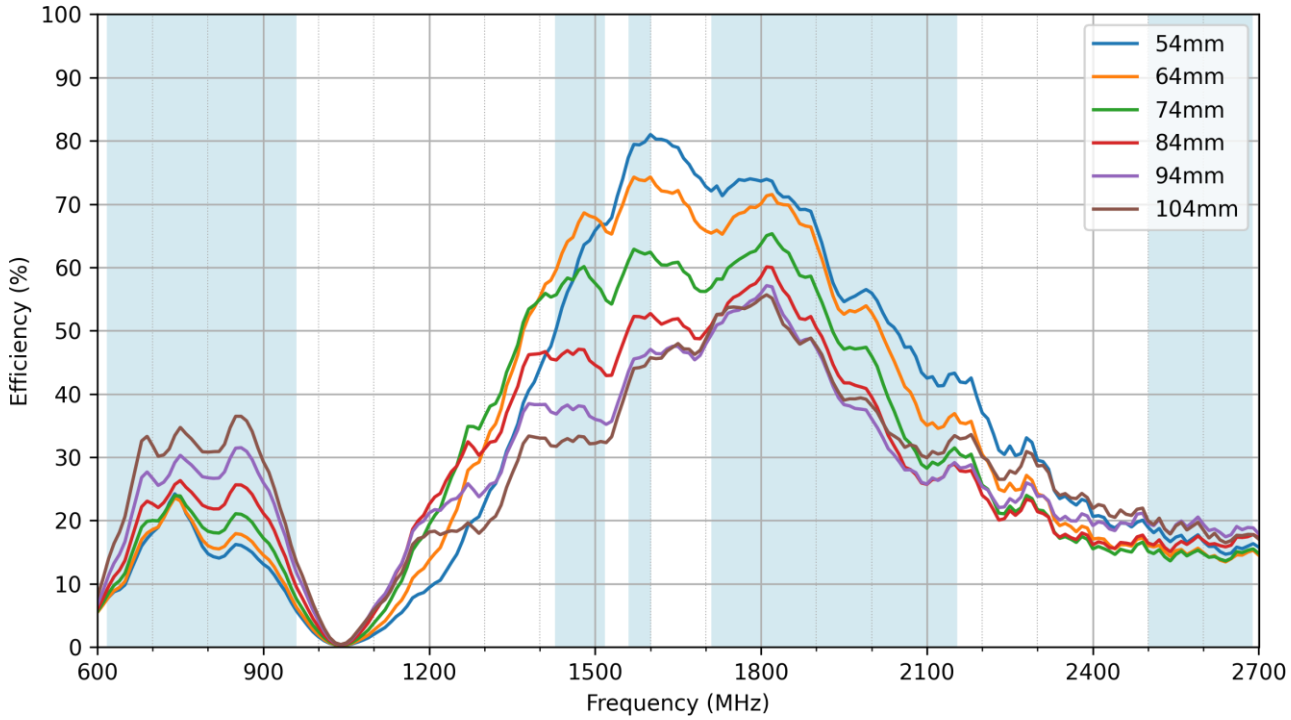
9.5 Average Gain – EMEA



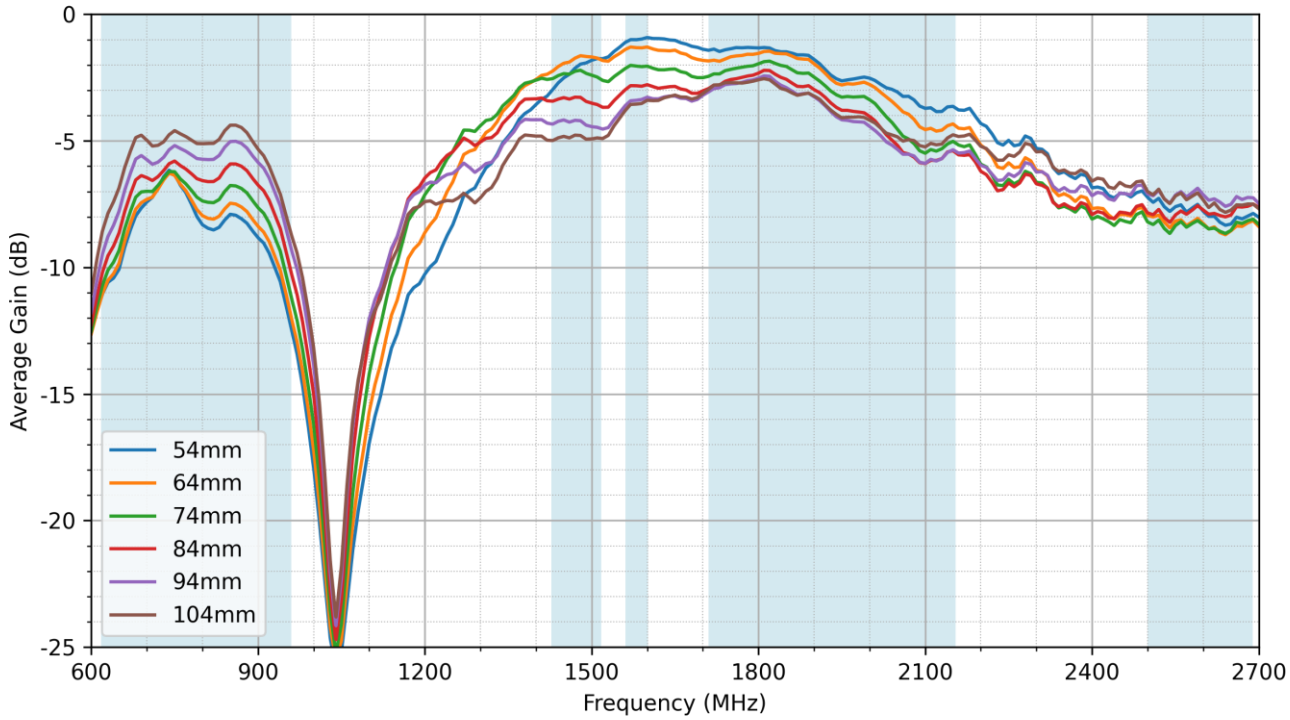
9.6 Peak Gain – EMEA



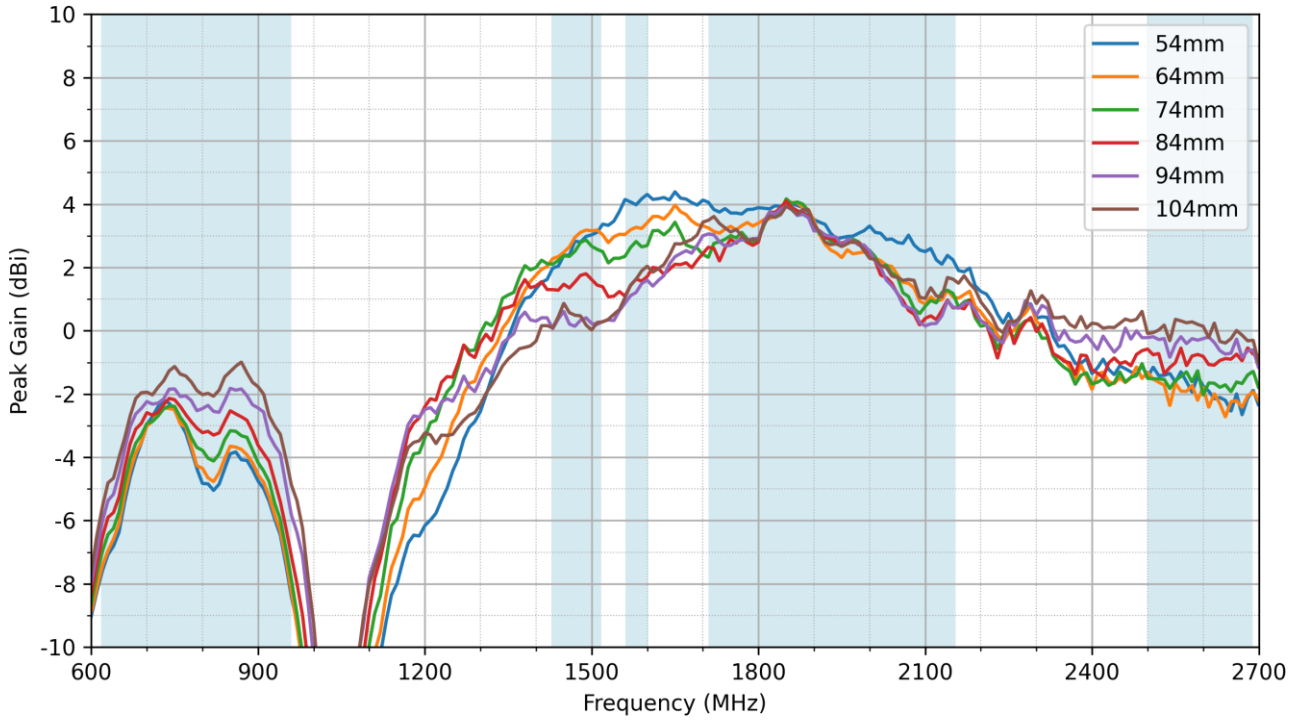
9.7 Efficiency – Worldwide



9.8 Average Gain – Worldwide

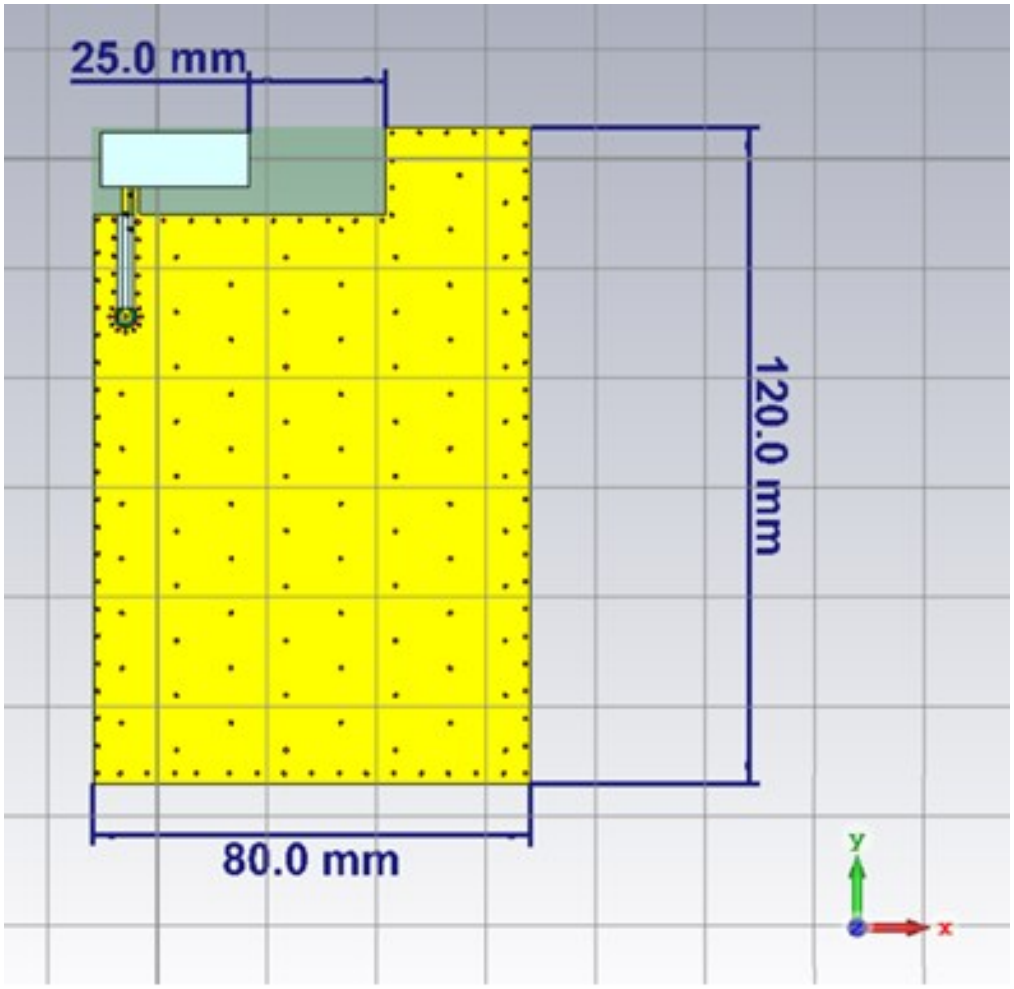


9.9 Peak Gain – Worldwide



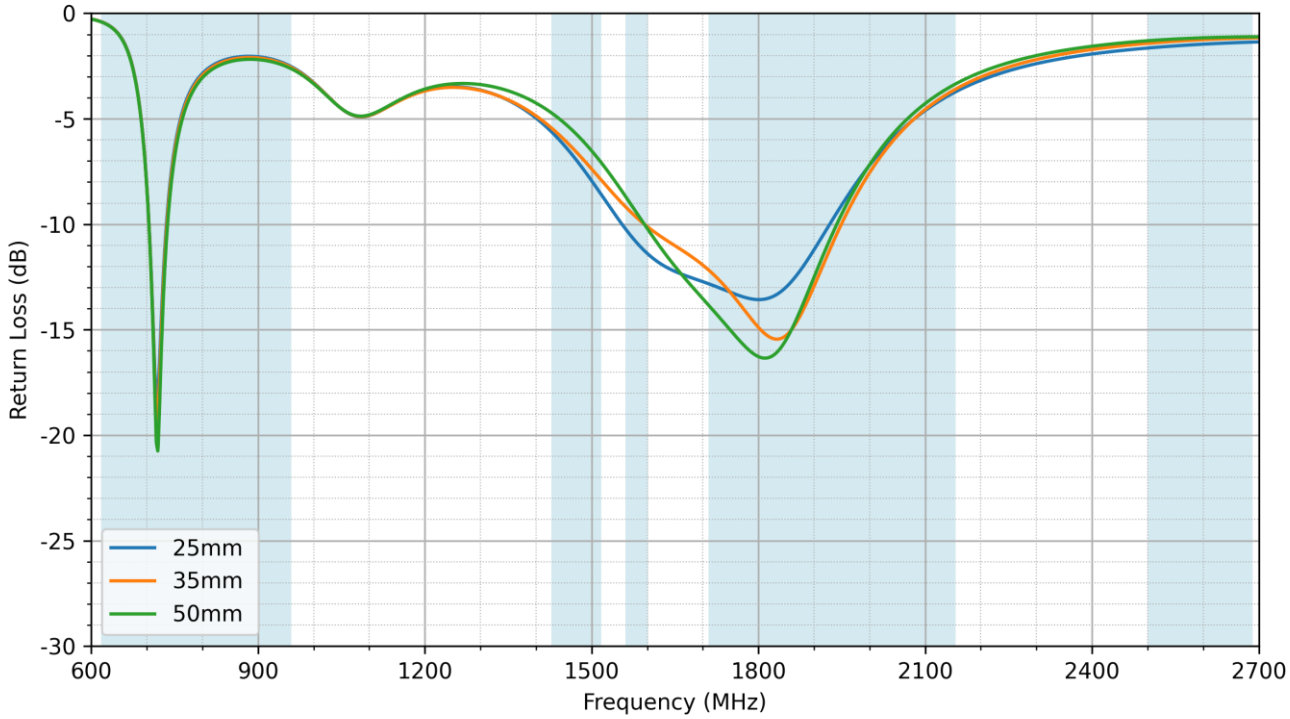
9.10 Effects of Right Side PCB Ground on Antenna Performance

The PCS.55.M antenna was tuned for a 120x80mm ground plane and the distance between the PCB ground on the right side of the antenna was parameterized and swept from 0 to 50 mm. The minimum condition, or 0mm, has the ground right up against the antenna and the maximum condition, or 50mm, has no ground on the right side of the antenna (i.e. a full 80x16mm keep out area). This was done in order to determine the minimum distance that the ground can be placed next to the antenna without affecting performance. The configuration with 25mm is shown below.

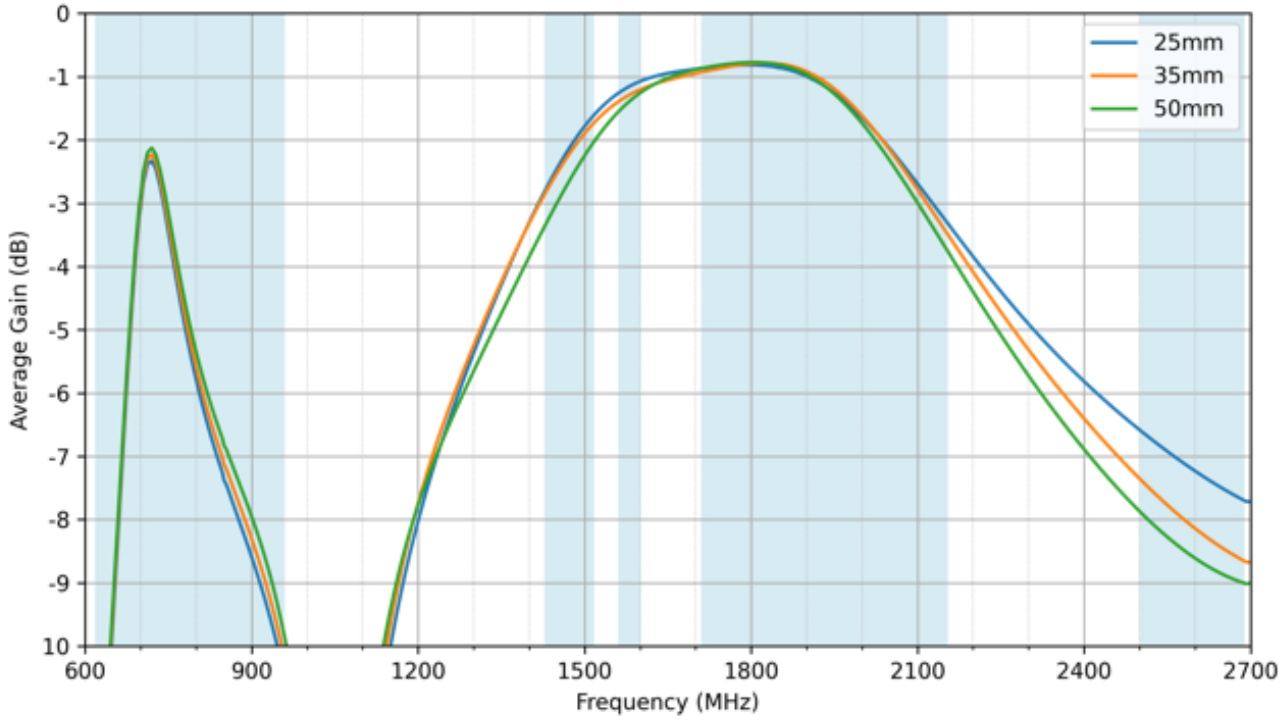


For minimal (0.2 dB) performance impact, a clearance of 25mm is recommended. Return loss and efficiency 25, 35 and 50mm clearance are shown below:

9.11 Return Loss

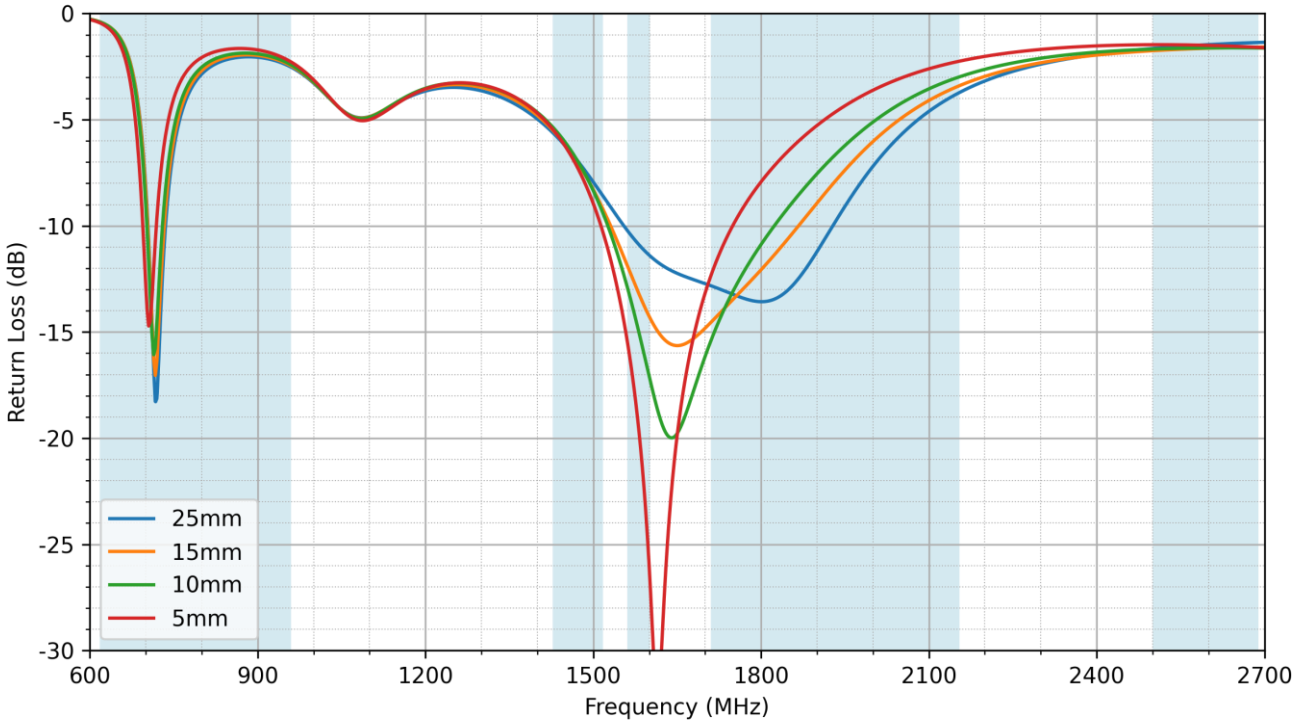


9.12 Efficiency

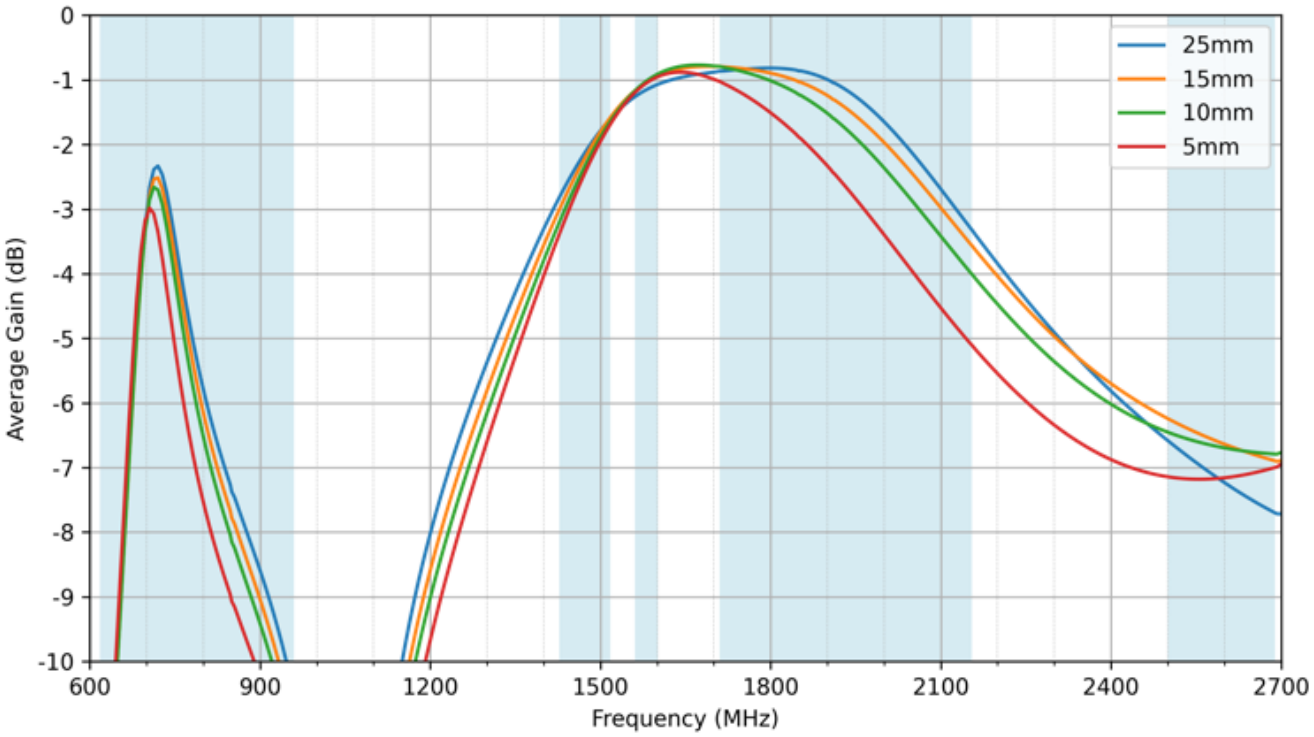


9.13 Return Loss

For more compact designs, a distance of 5 or 10mm can be implemented at the cost of efficiency and bandwidth as shown below:



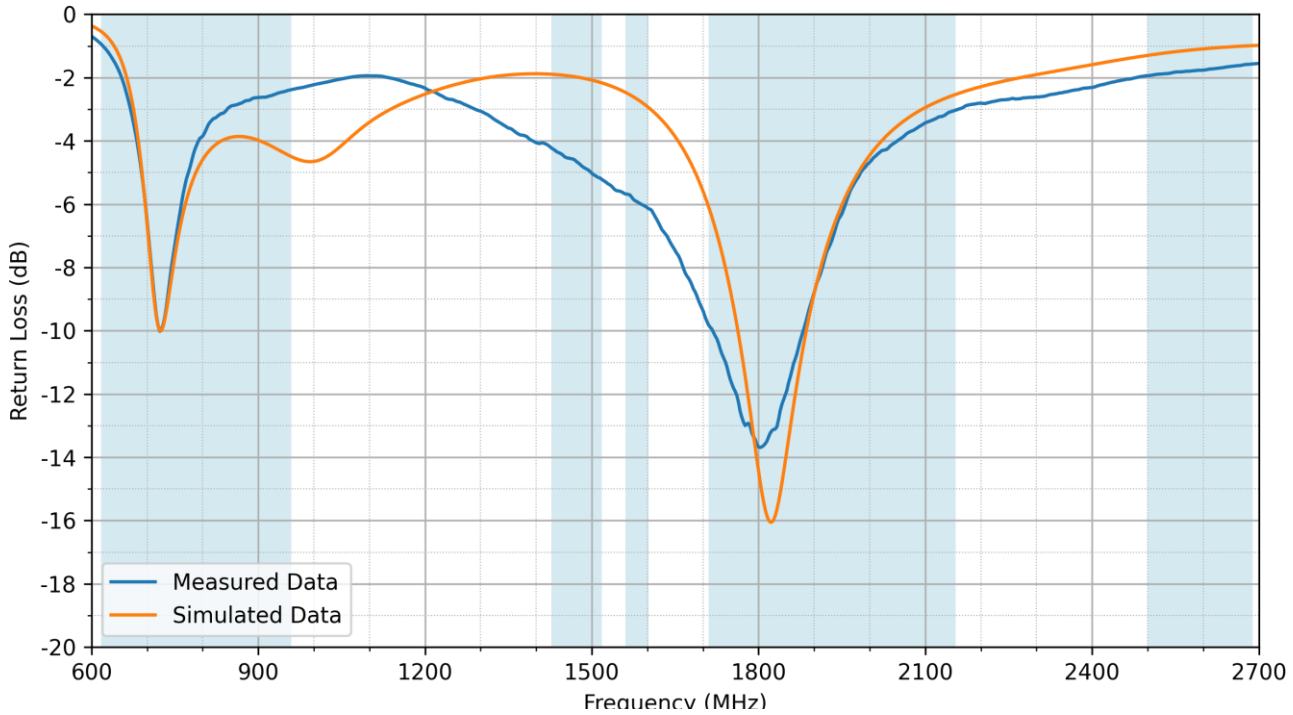
9.14 Efficiency

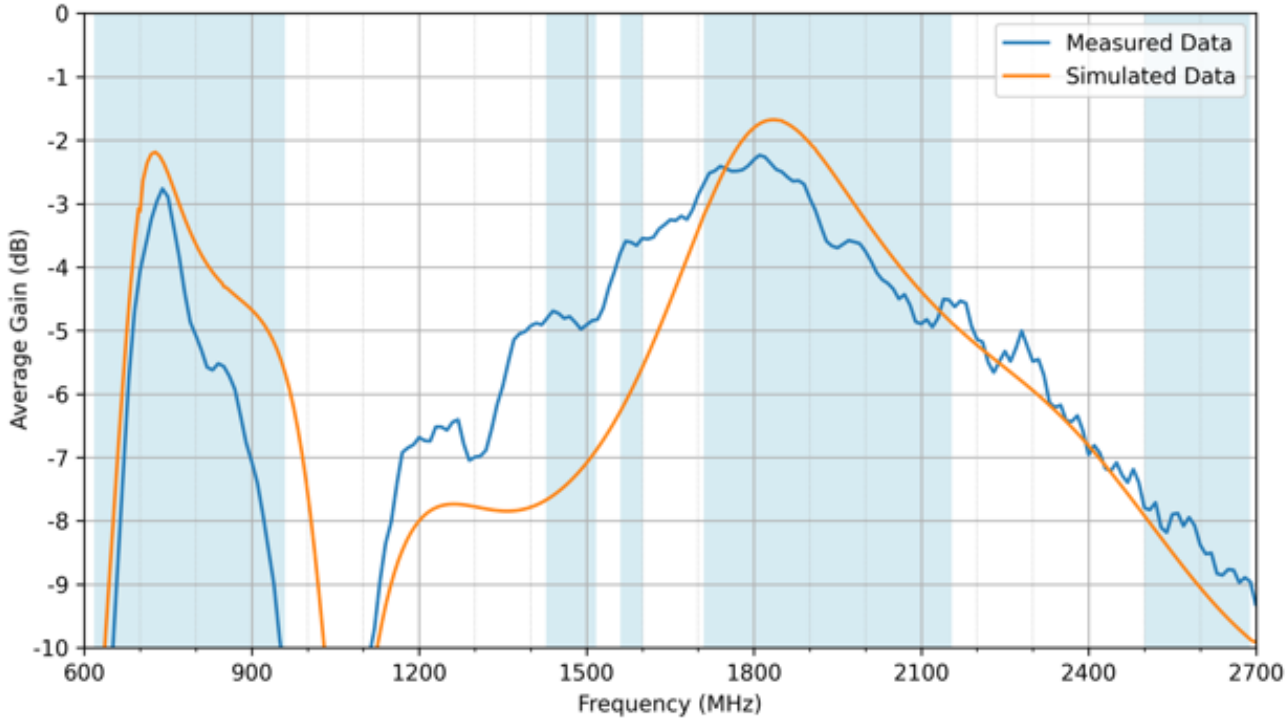


9.15 Correlation of CST Blackbox Model to Measured Results

To evaluate the accuracy of the CST Blackbox Model available to all customers, the following comparisons of return loss and efficiency have been made:

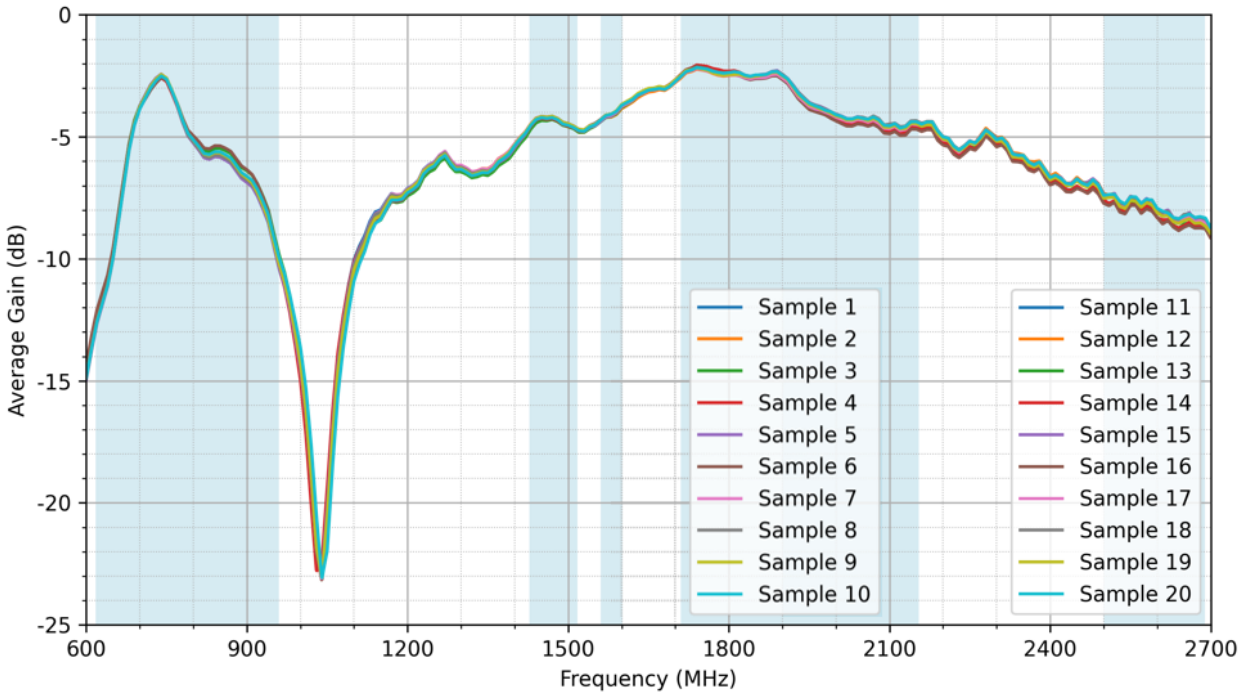
Please note the following simulated results were run at 18 cells/wavelength and with a -80 dB accuracy criterion. The measured results are for the PCS.55.M evaluation board with the NA tuning in place.





9.16 Repeatability Study

In order to verify the repeatability of the design, 20 production samples of the evaluation board for the PCS.55.M were tested in an anechoic chamber on the same day with standard SMA torque of 1 N·m.



10. Application Note (PCS.55.M – PCS.55.A)

10.1 Ground Plane Study for PCS.55 MIMO Board 65mm Wide (8mm SEP)

The influence of the long side of the ground plane, while the short side is constantly 65mm (maintaining the 8mm gap between 2 antennas), is evaluated following the methodology presented below. The following lengths are tested: 120mm, 110mm, 100mm, 90mm, 80mm and 70mm.

70mm x 65mm

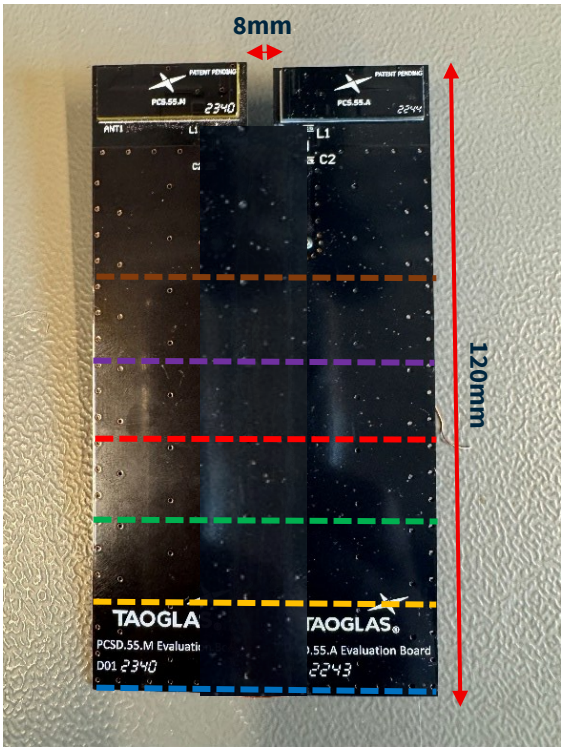
80mm x 65mm

90mm x 65mm

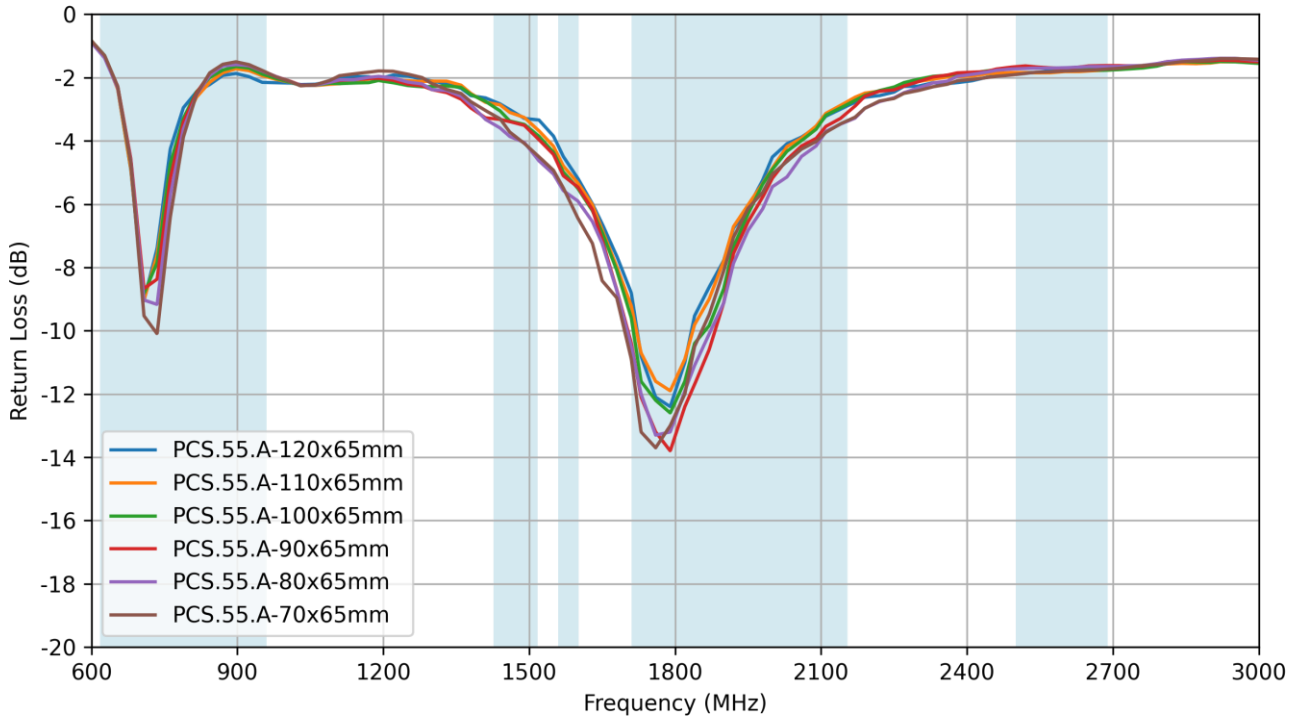
100mm x 65mm

110mm x 65mm

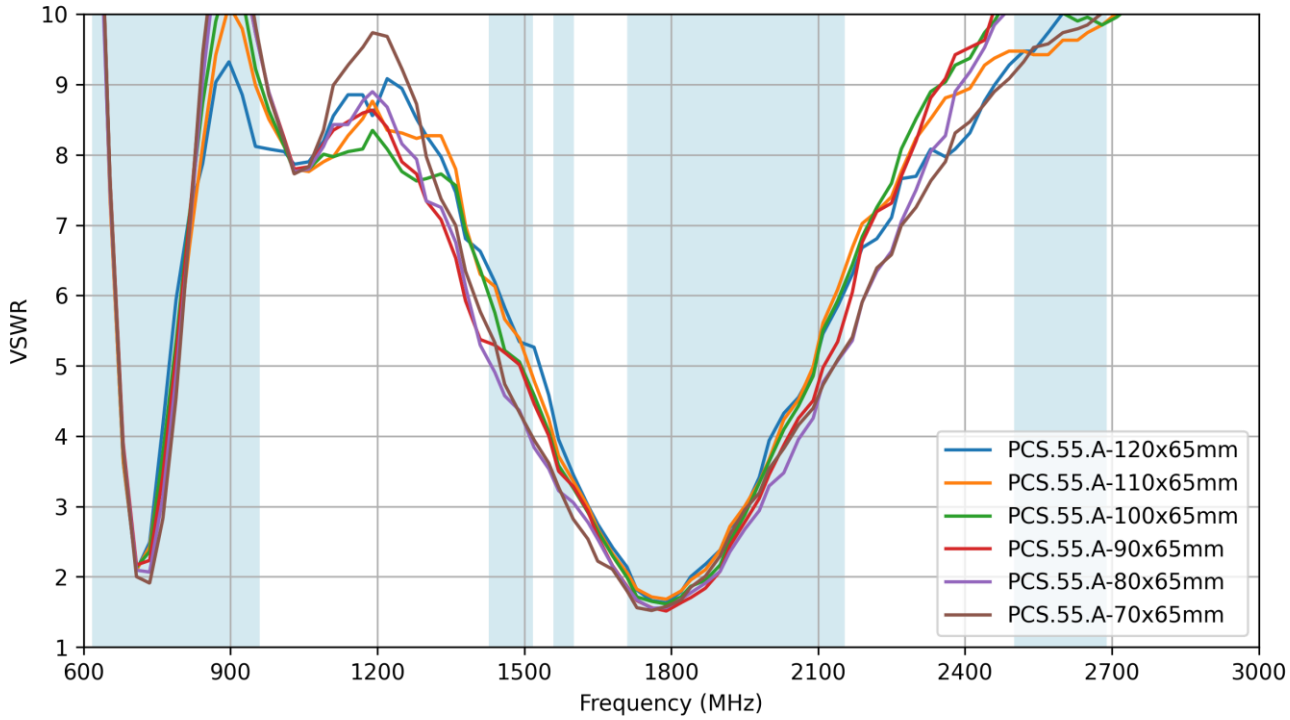
120mm x 65mm



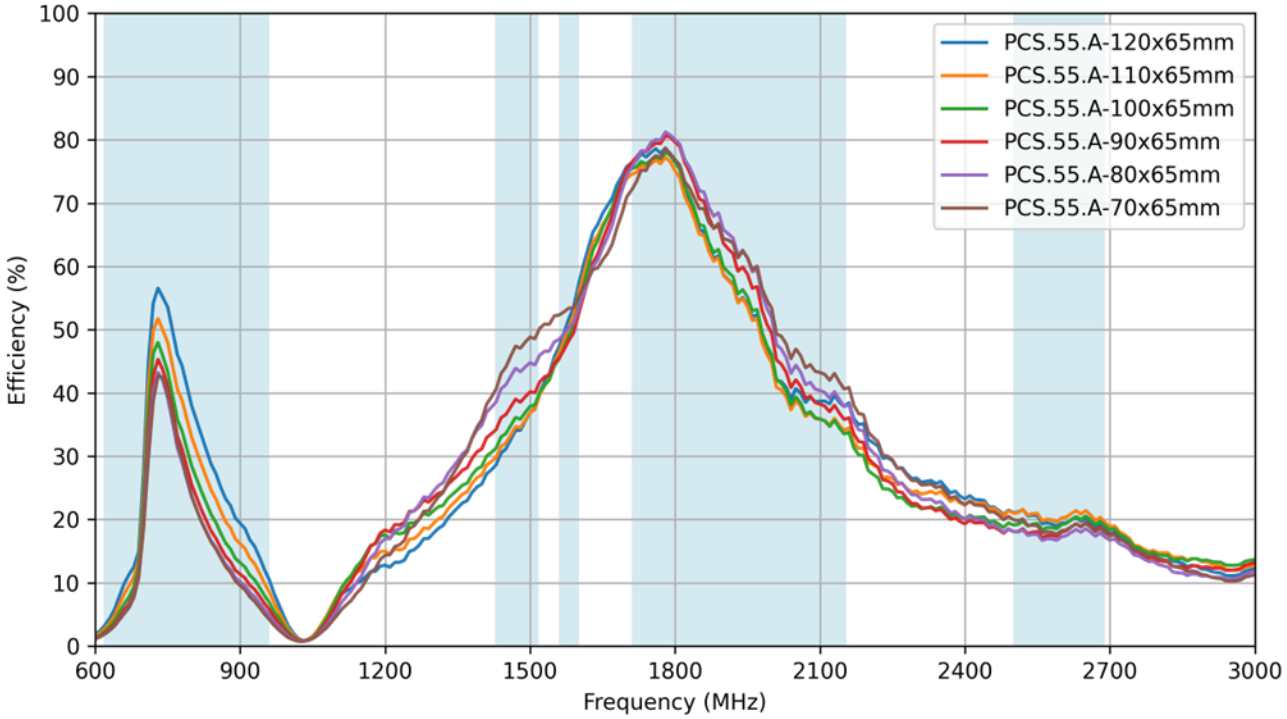
10.2 PCS.55.A - Return Loss



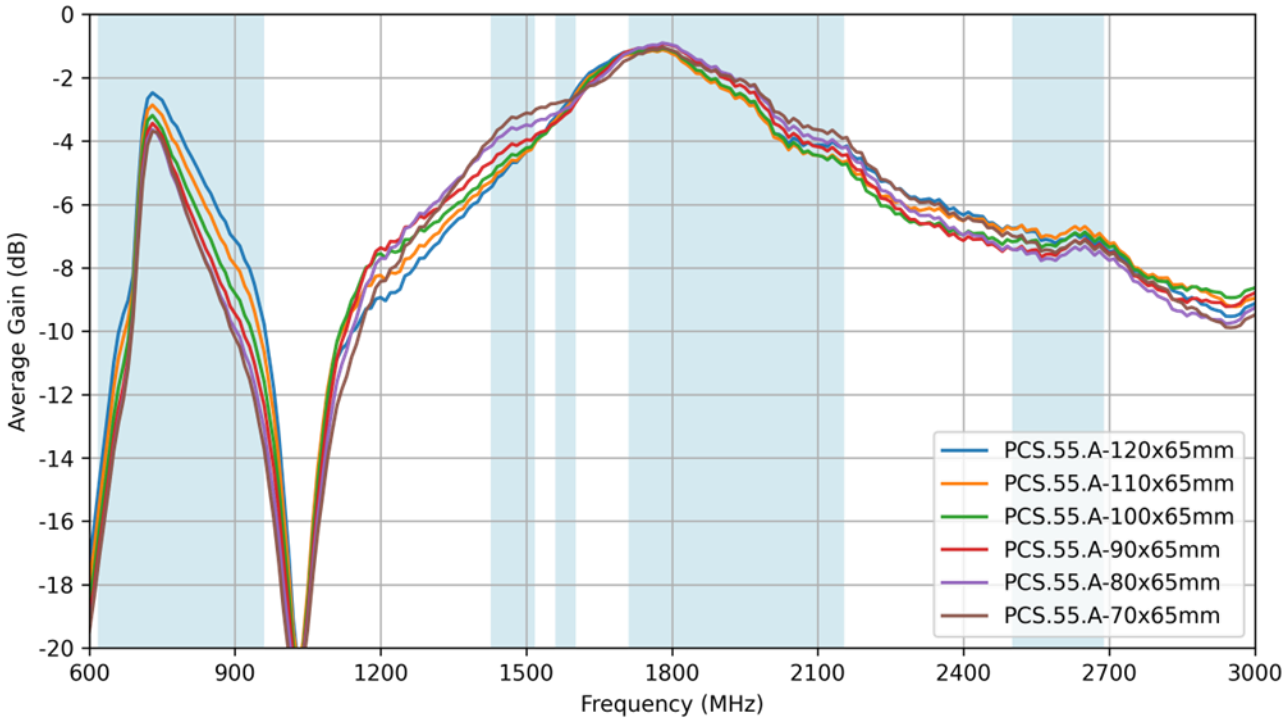
10.3 PCS.55.A - VSWR



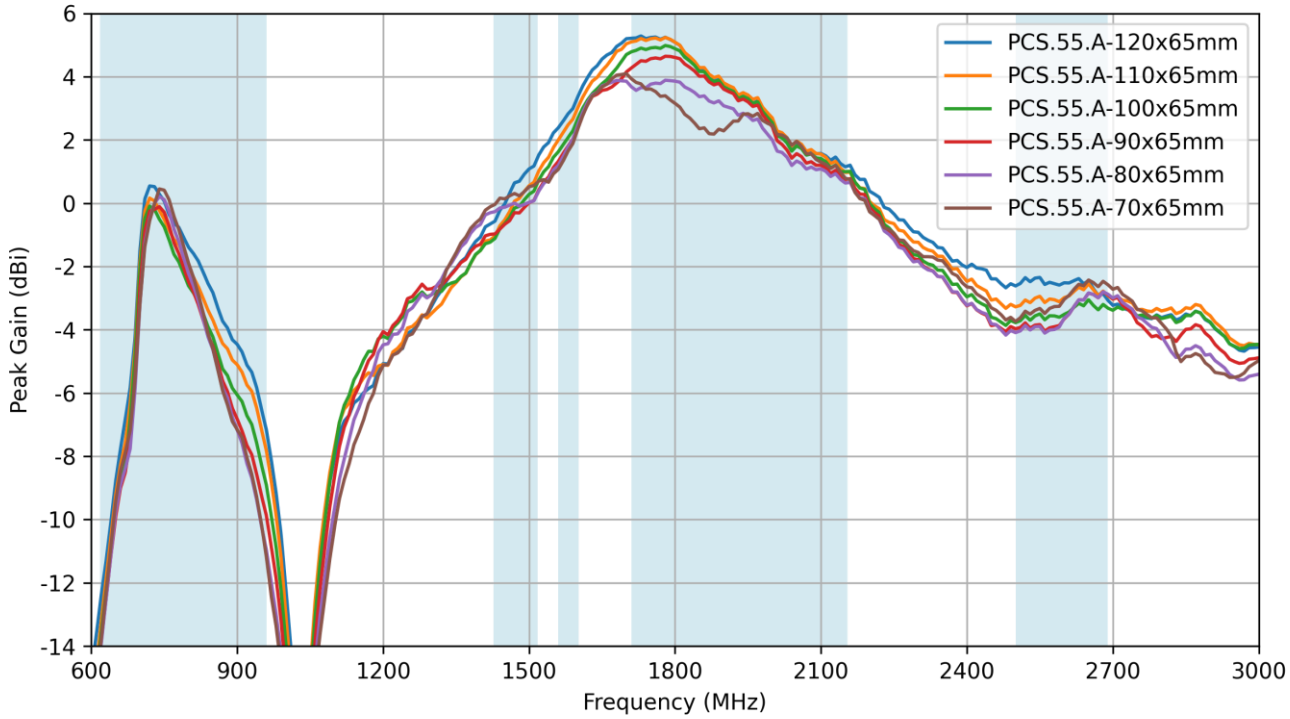
10.4 PCS.55.A - Efficiency



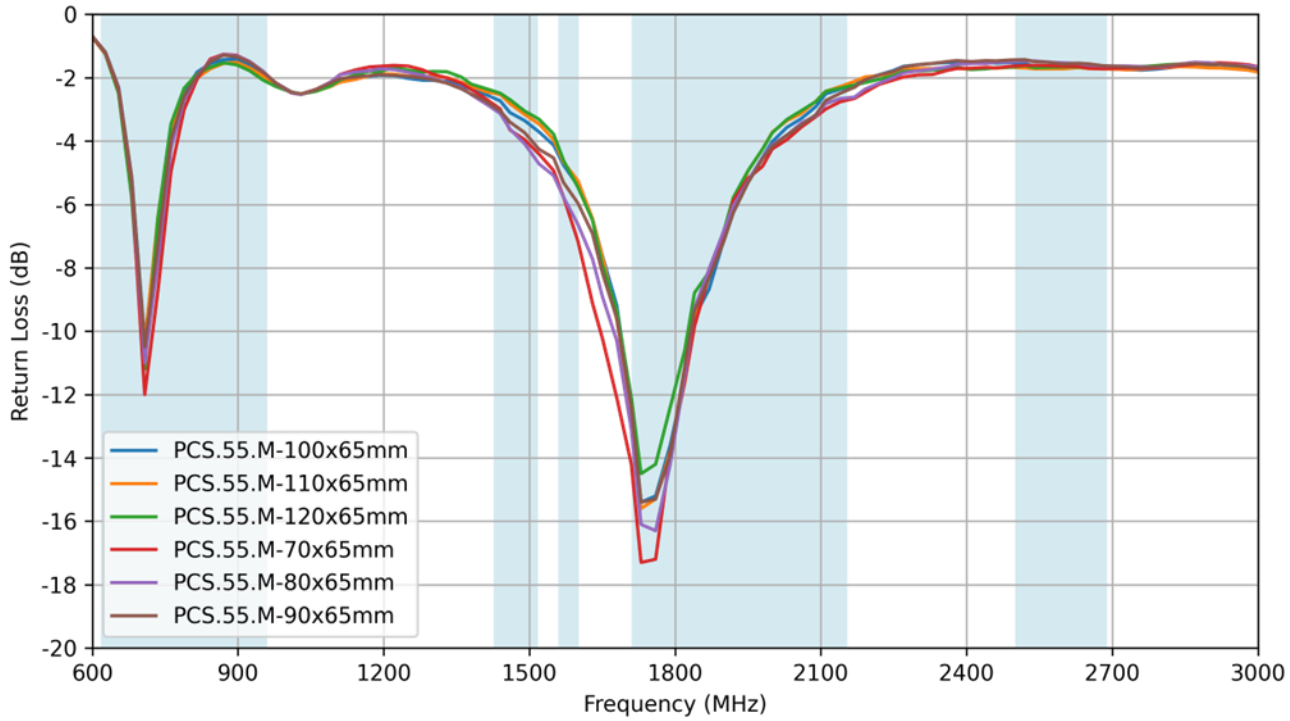
10.5 PCS.55.A - Average Gain



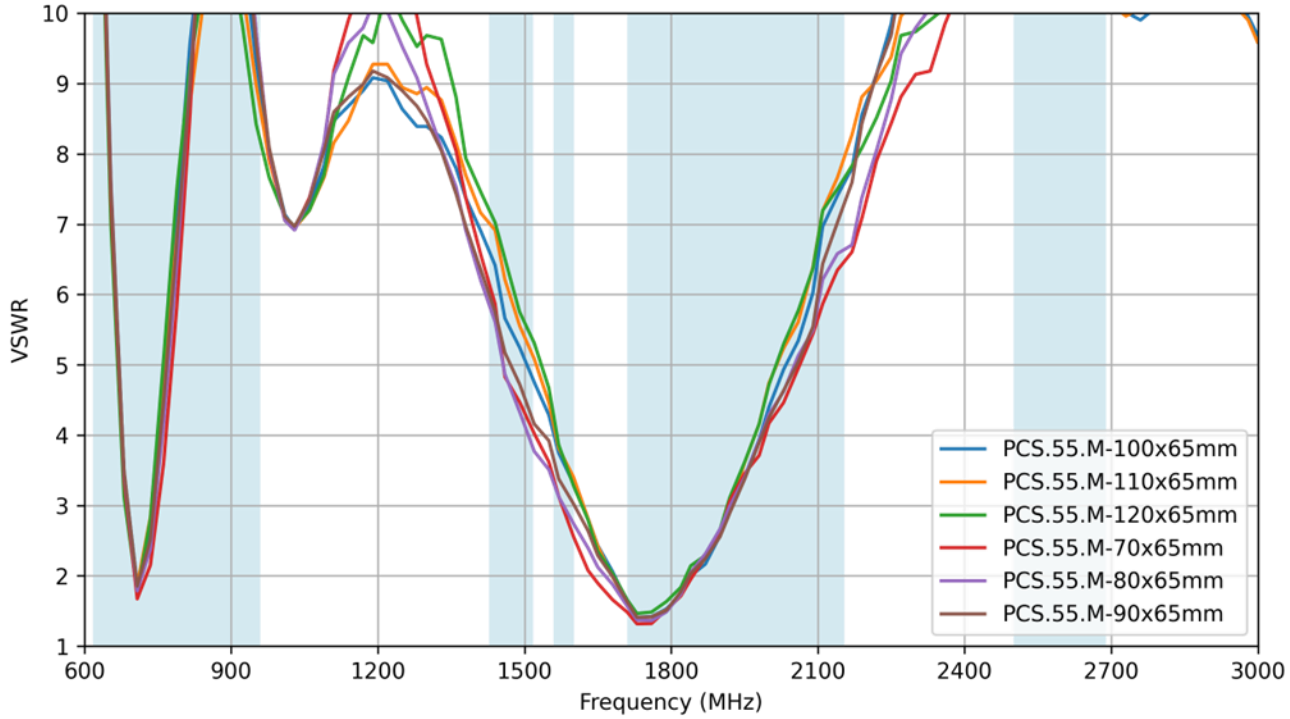
10.6 PCS.55.A - Peak Gain



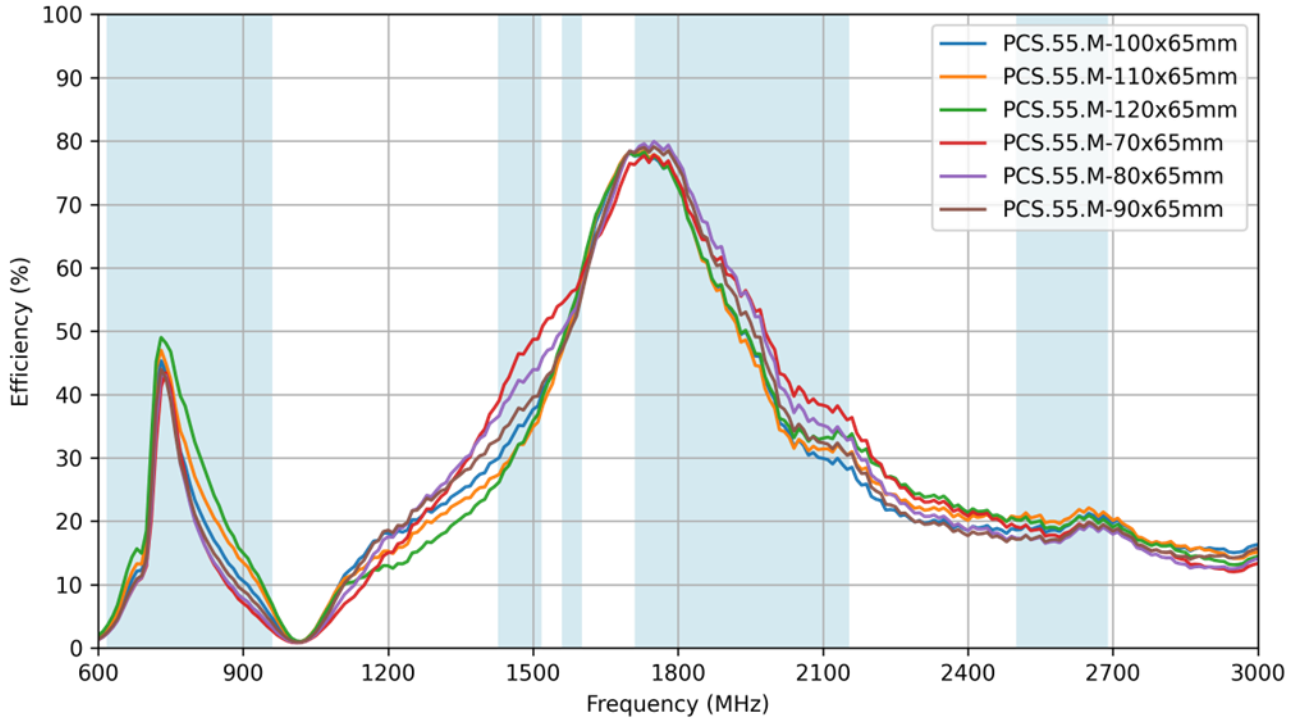
10.7 PCS.55.M - Return Loss



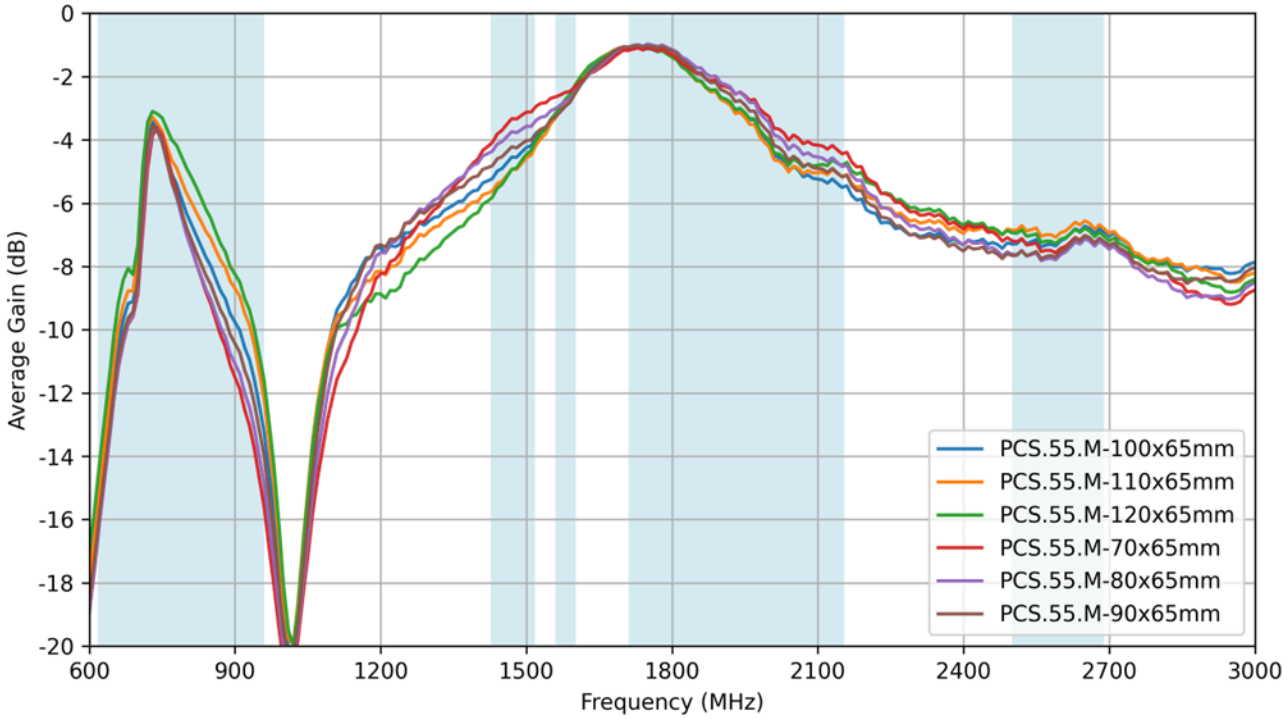
10.8 PCS.55.M - VSWR



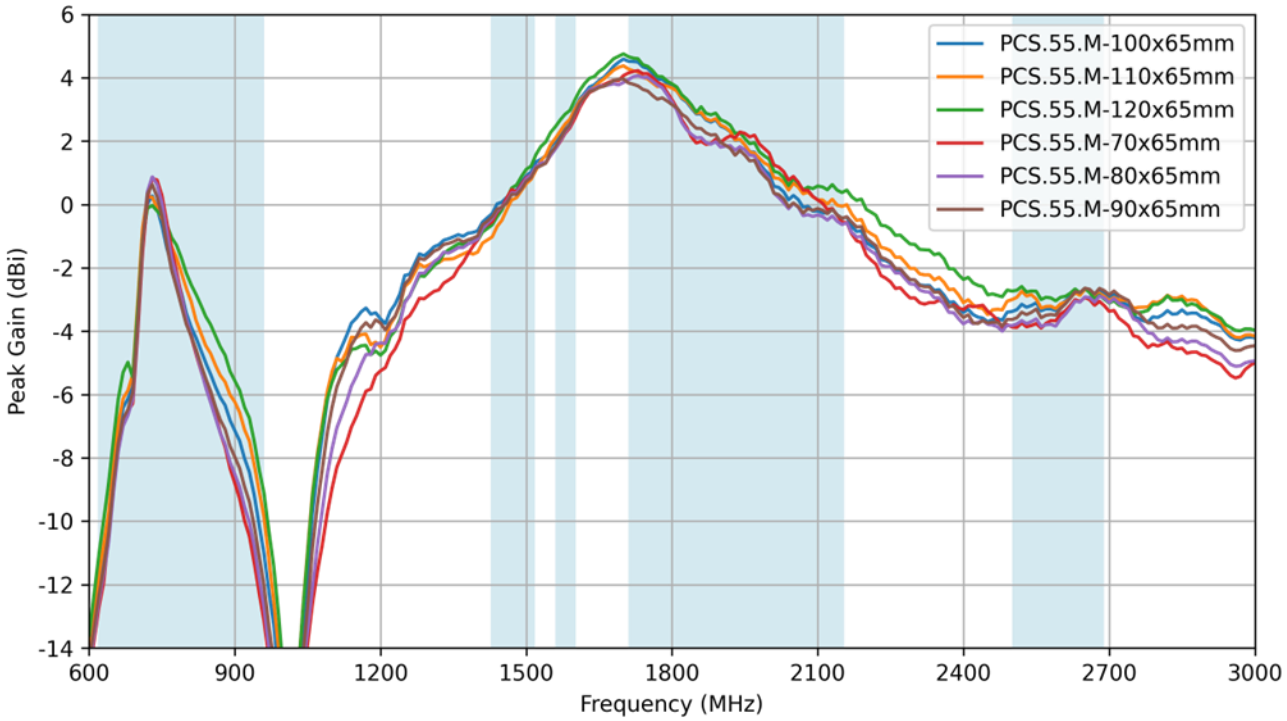
10.9 PCS.55.M - Efficiency



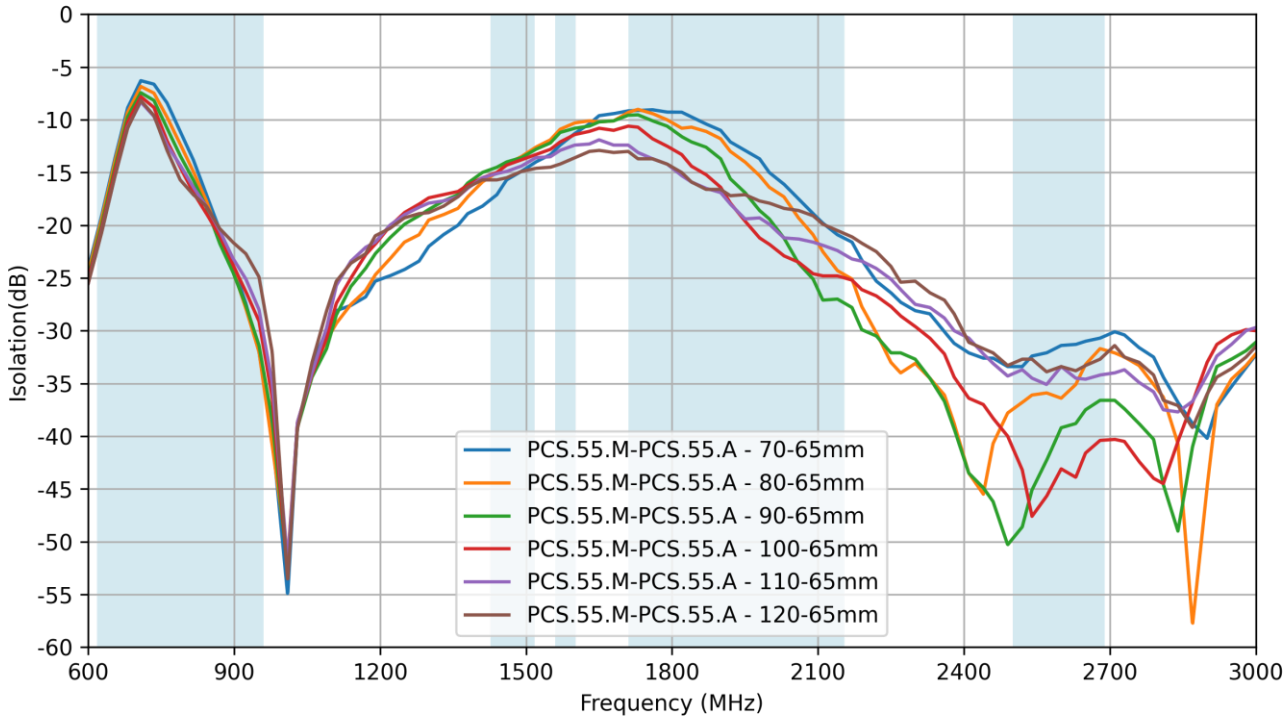
10.10 PCS.55.M - Average Gain



10.11 PCS.55.M - Peak Gain



10.12 Isolation



10.13 Ground Plane Study for PCS.55 MIMO Board 70mm Wide (13mm SEP)

The influence of the long side of the ground plane, while the short side is constantly 70mm (maintaining the 13mm gap between 2 antennas), is evaluated following the methodology presented below. The following lengths are tested: 120mm, 110mm, 100mm, 90mm, 80mm and 70mm.

70mm x 70mm

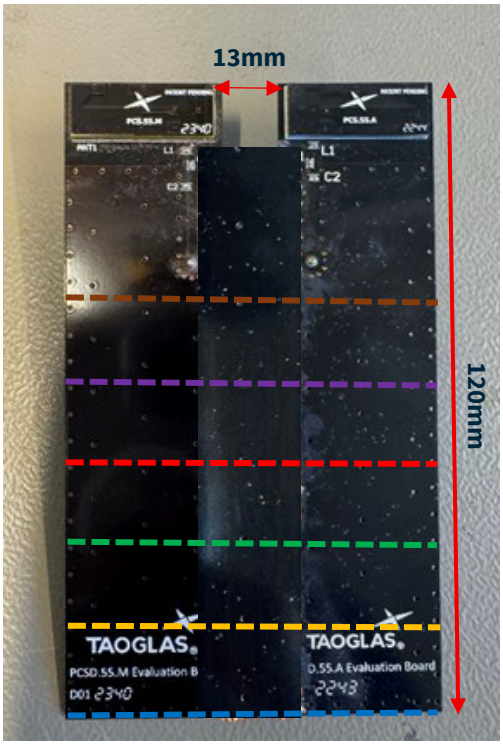
80mm x 70mm

90mm x 70mm

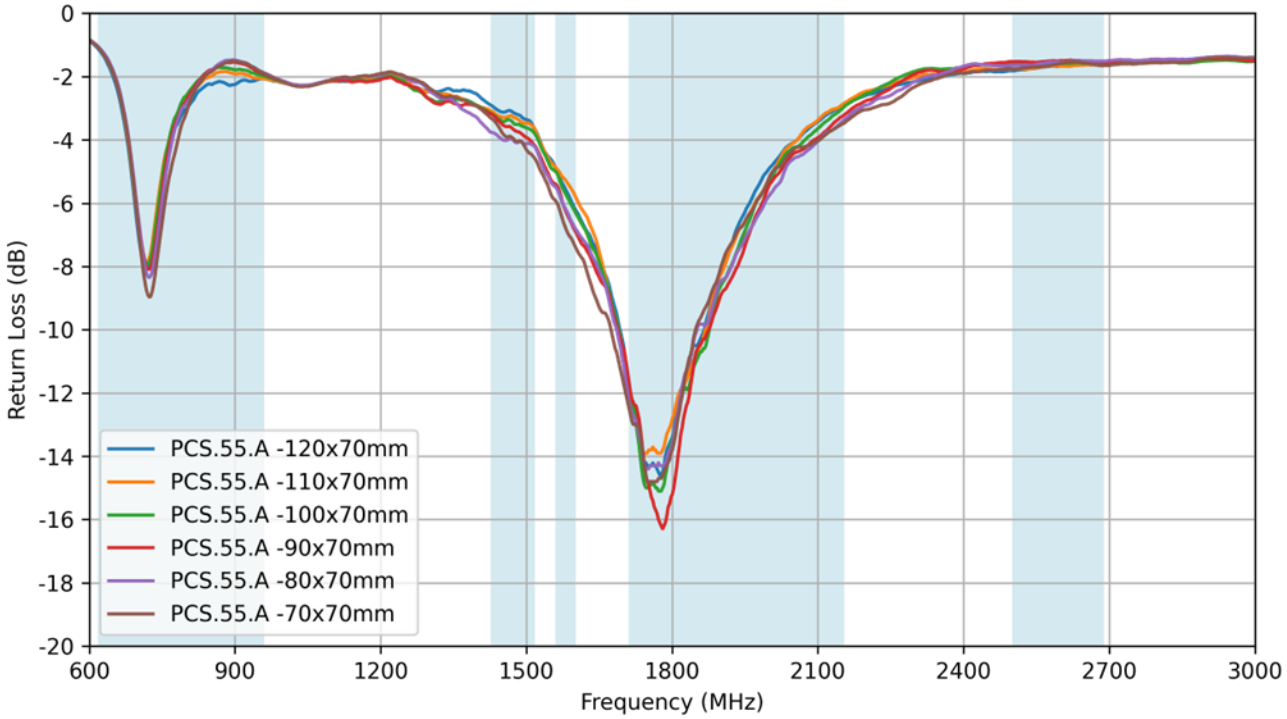
100mm x 70mm

110mm x 70mm

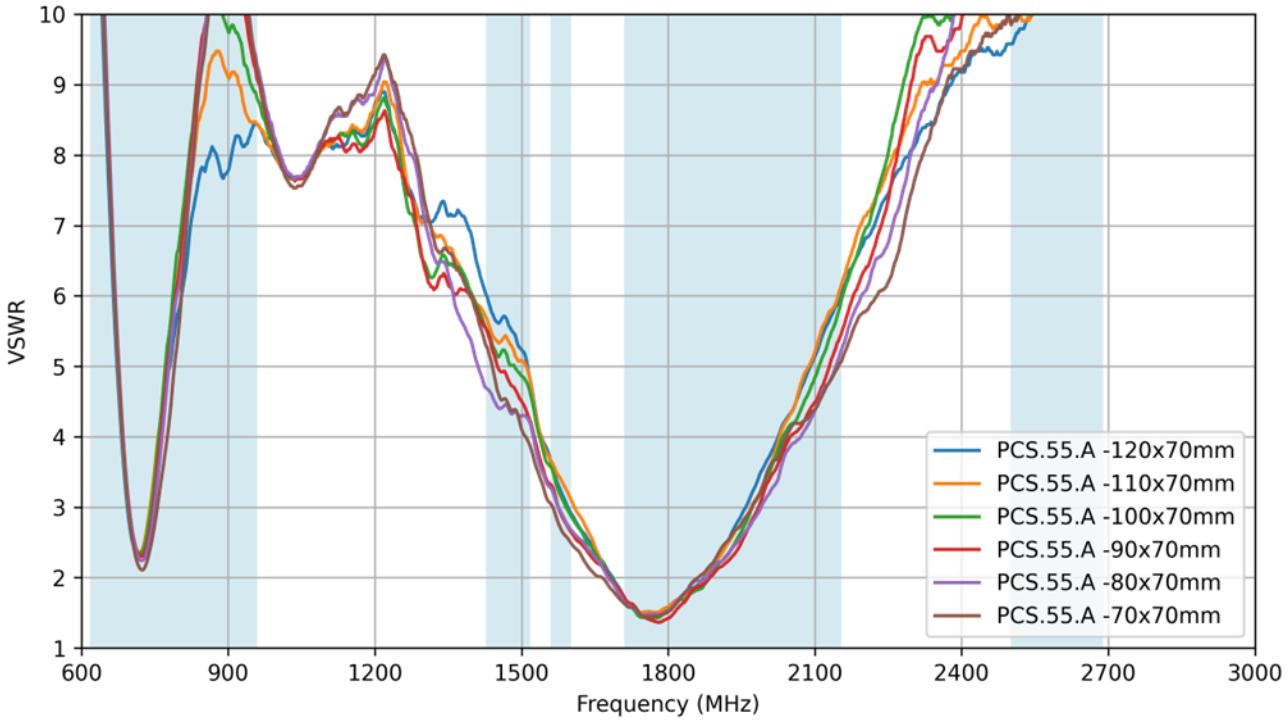
120mm x 70mm



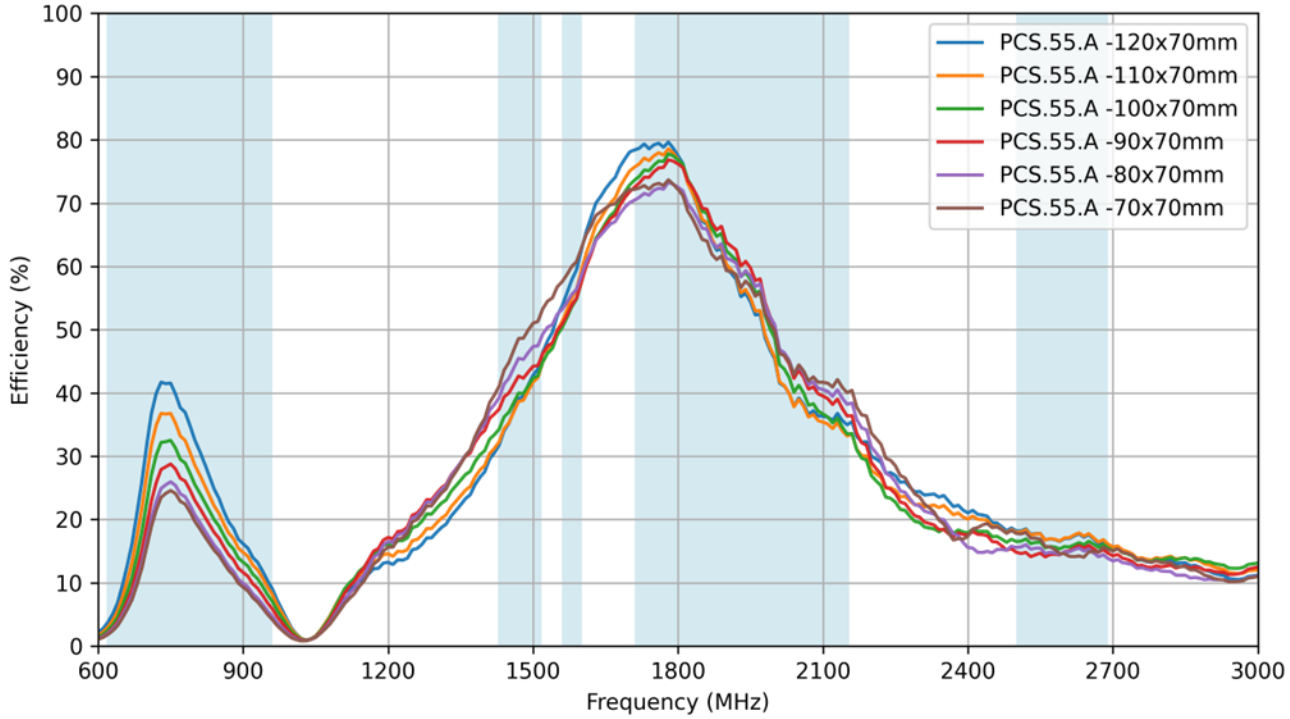
10.14 PCS.55.A - Return Loss



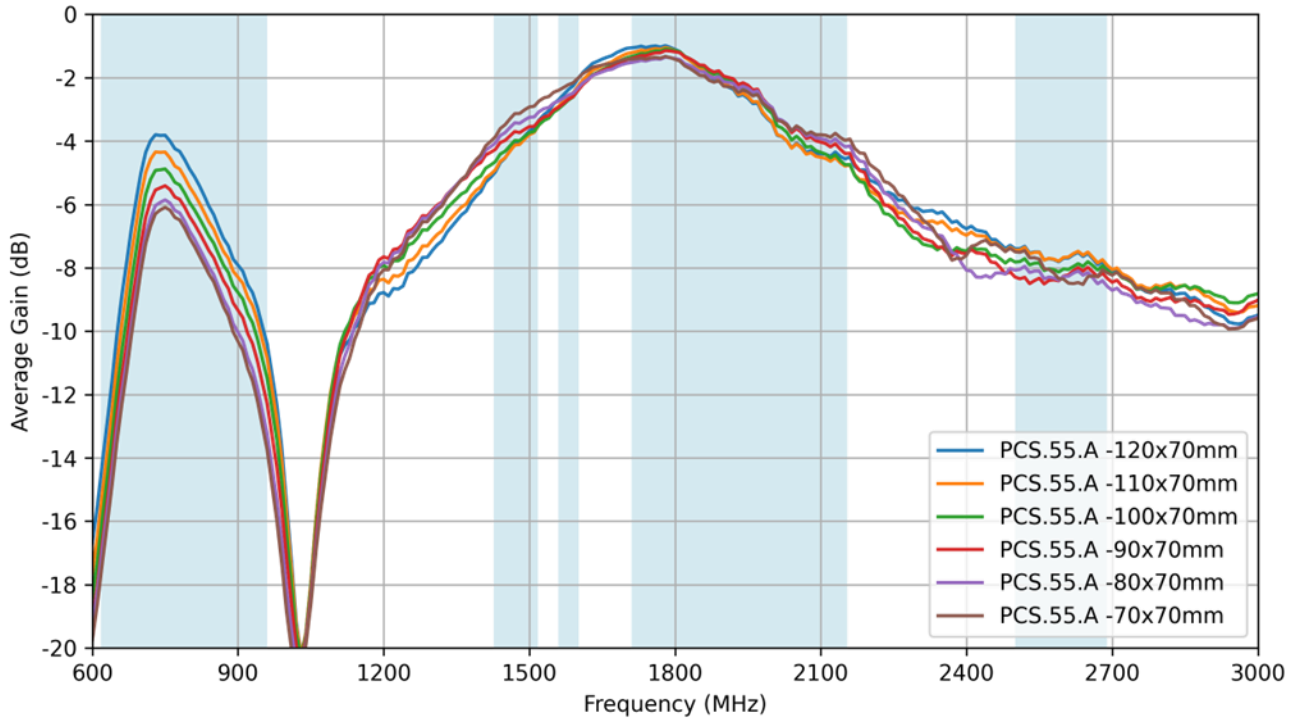
10.15 PCS.55.A - VSWR



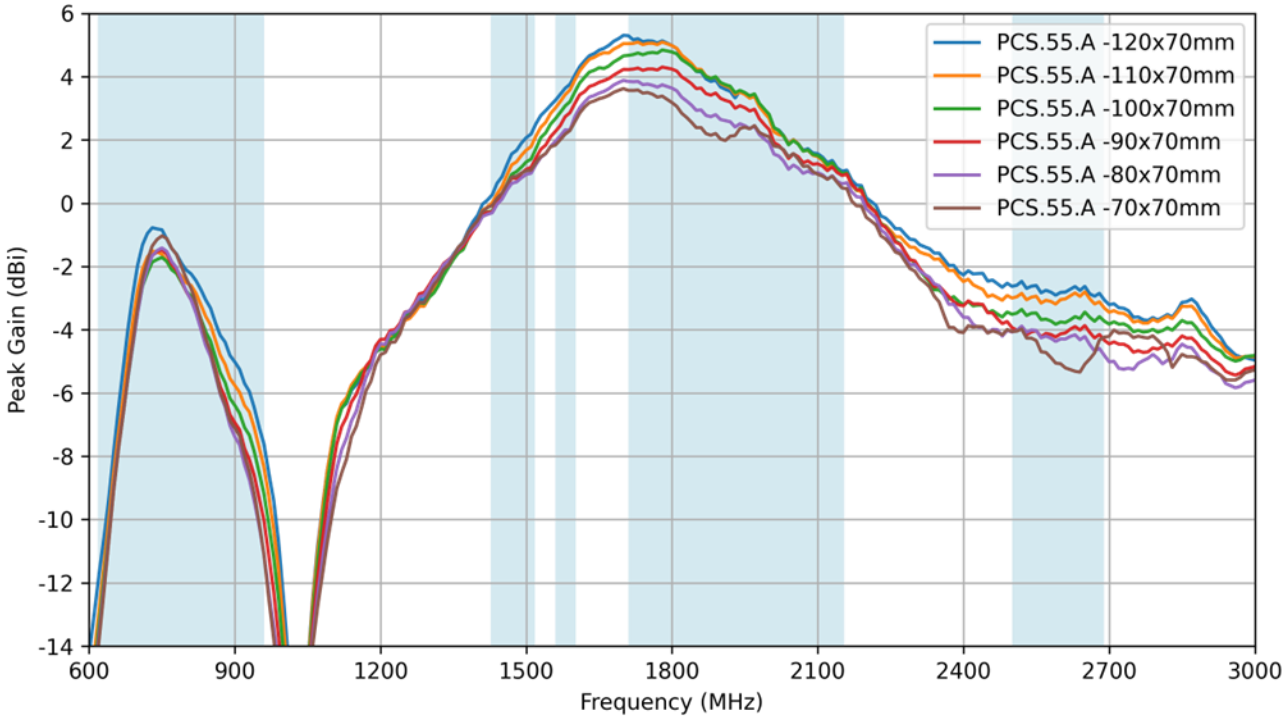
10.16 PCS.55.A - Efficiency



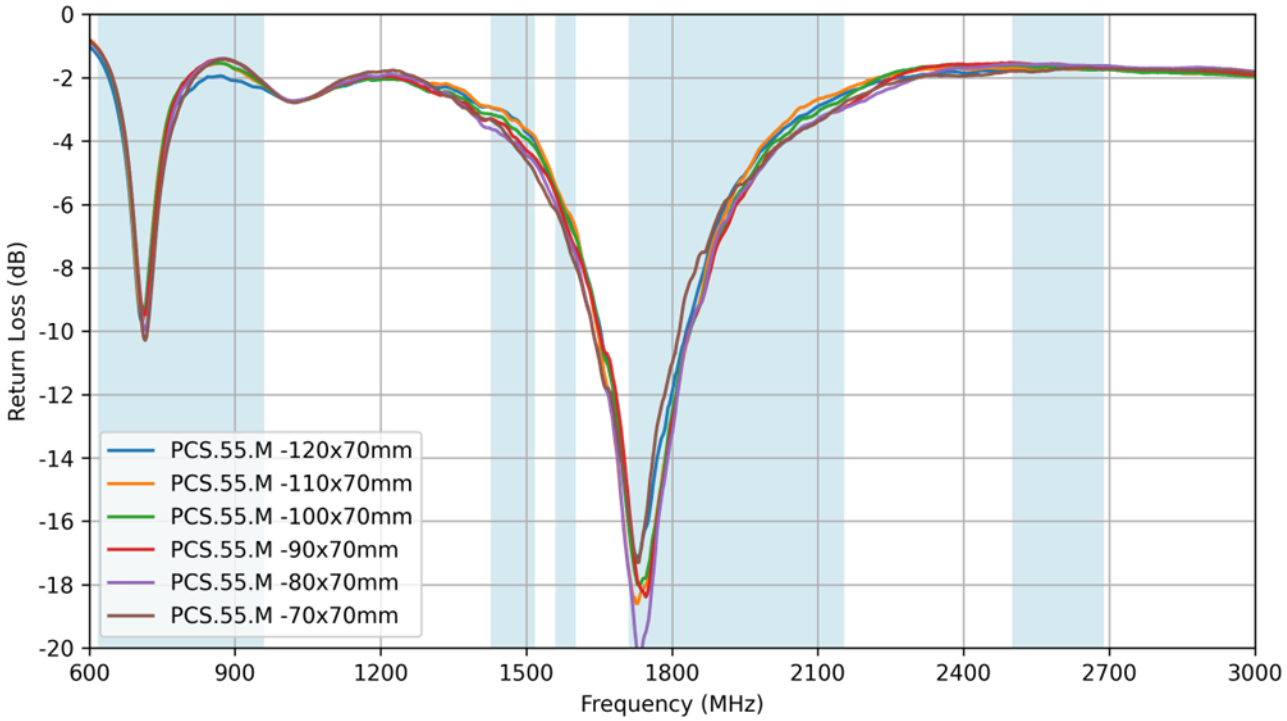
10.17 PCS.55.A - Average Gain



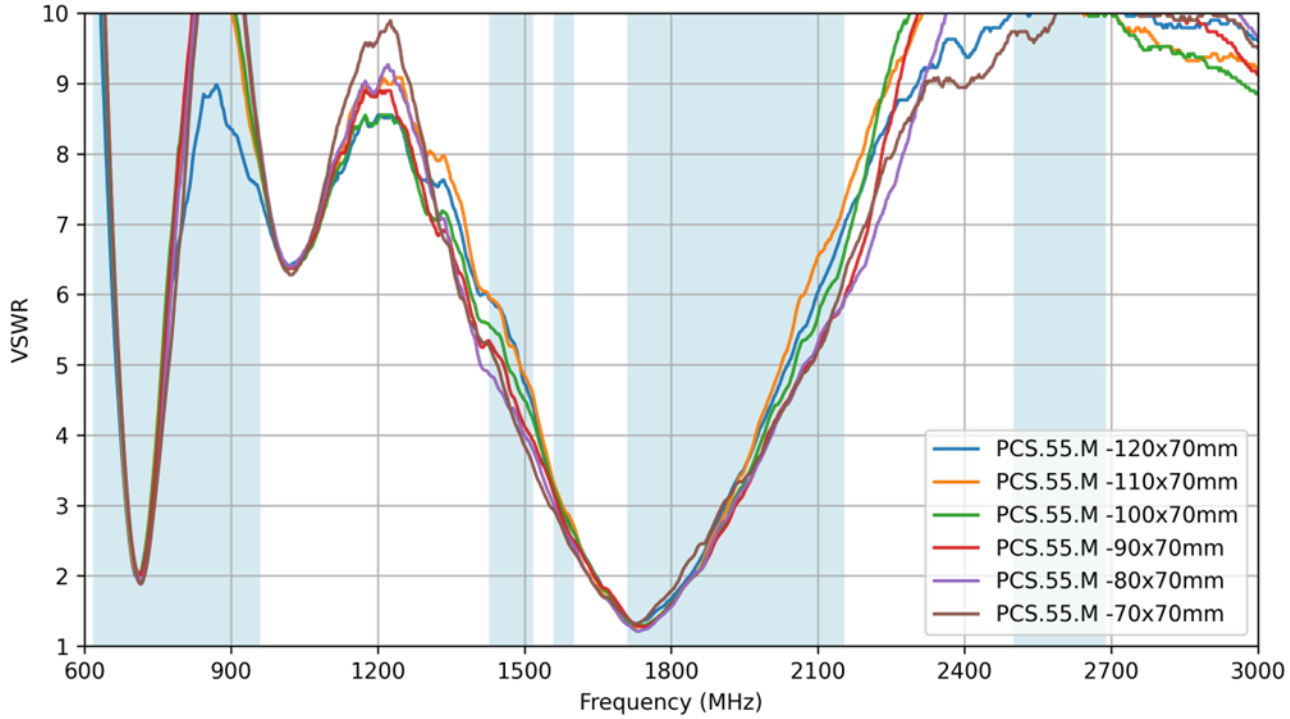
10.18 PCS.55.A - Peak Gain



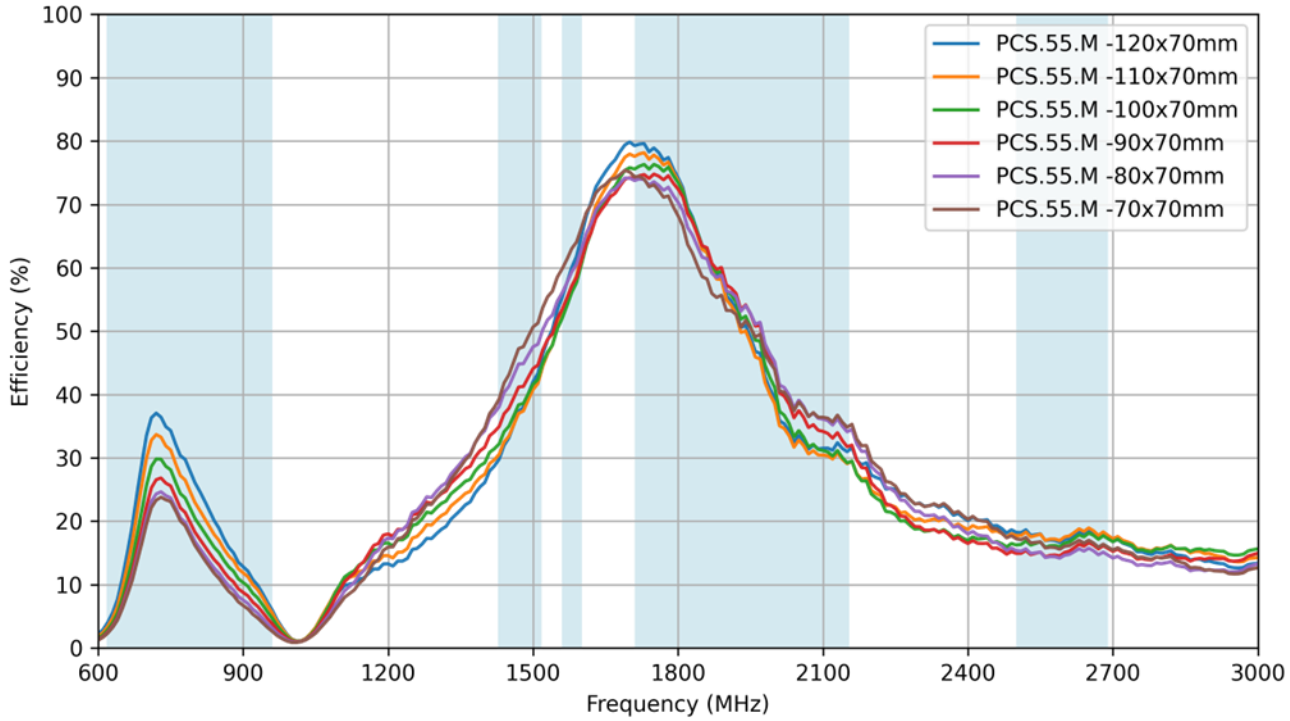
10.19 PCS.55.M - Return Loss



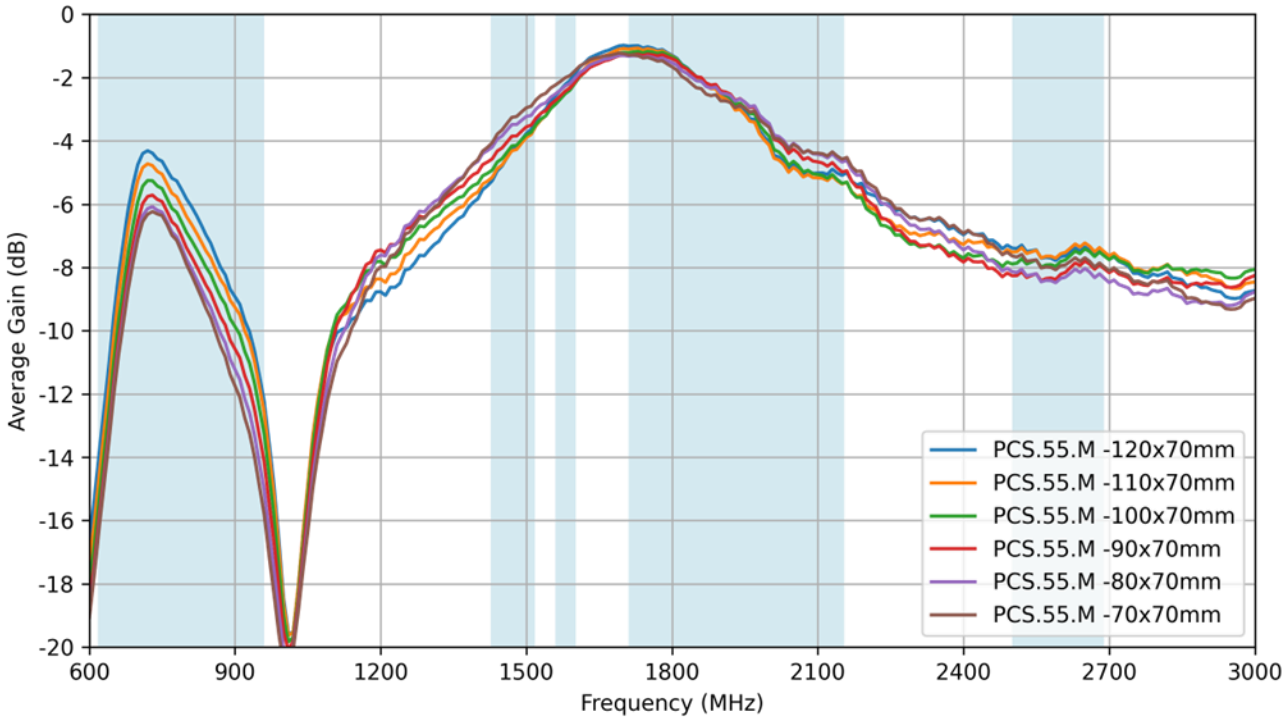
10.20 PCS.55.M - VSWR



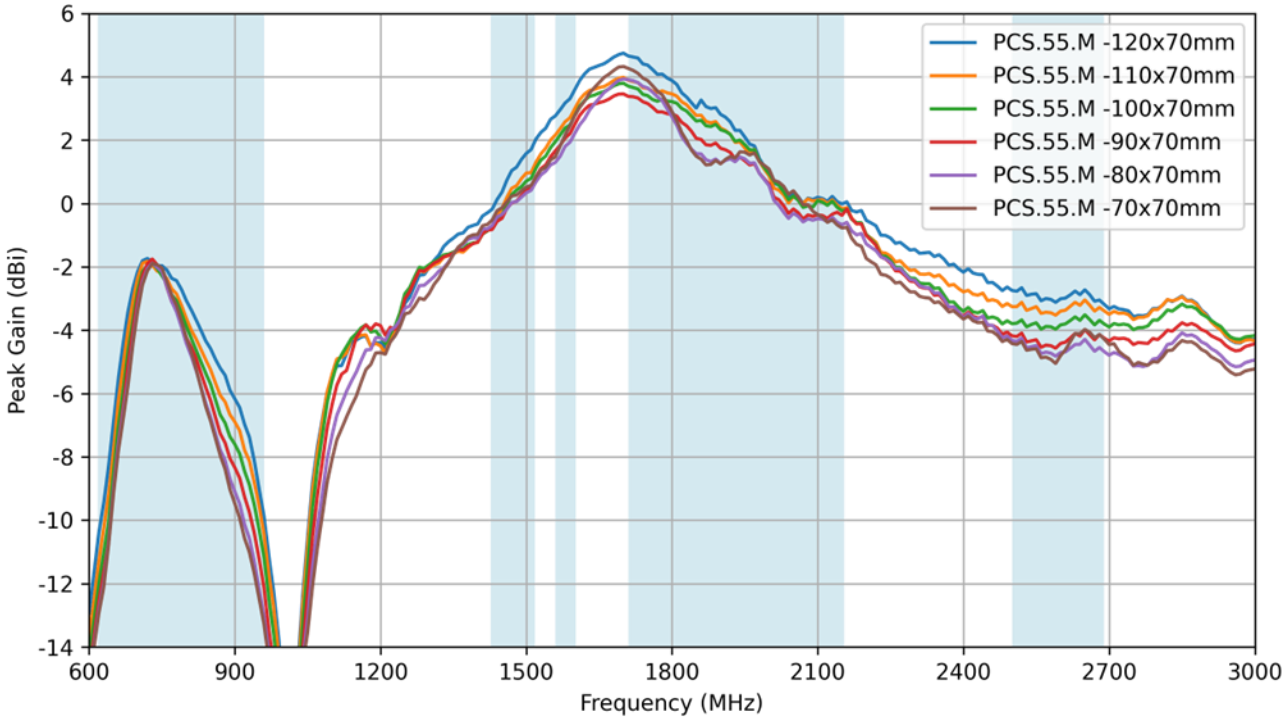
10.21 PCS.55.M - Efficiency



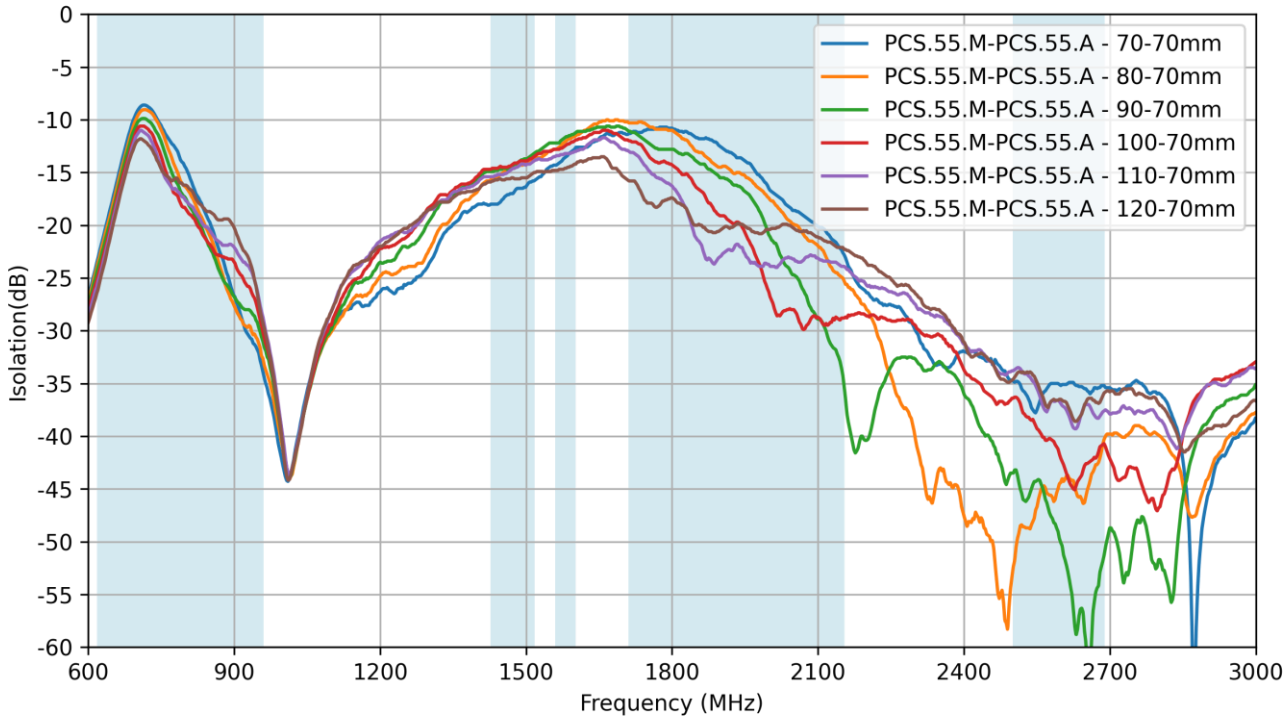
10.22 PCS.55.M - Average Gain



10.23 PCS.55.M - Peak Gain



10.24 Isolation



Changelog for the datasheet

SPE-23-8-281 – PCS.55.M

Revision: B (Current Version)	
Date:	2025-07-18
Changes:	Added application note and updated antenna integration guide.
Changes Made by:	Gary West

Previous Revisions

Revision: A (First Release)	
Date:	2023-09-28
Changes:	Initial Release
Changes Made by:	Gary West

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