

# Edimax EW 7822 MSX 2X2 Dual Band Dongle Antenna Measurement Report

**Date: March 1<sup>st</sup>, 2022**

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# Introduction

**This report presents Antenna performance for Edimax EW7822 MSX 2X2 Dual Band Wi-Fi Dongle preliminary antenna configuration**

**Airgain Received a prototype of EW7822MSX from the customer on December 20<sup>th</sup>, 2021.**

**Airgain measured the ID with three different antenna hinge angles requested by customer**

**The solution for this device is as follows:**

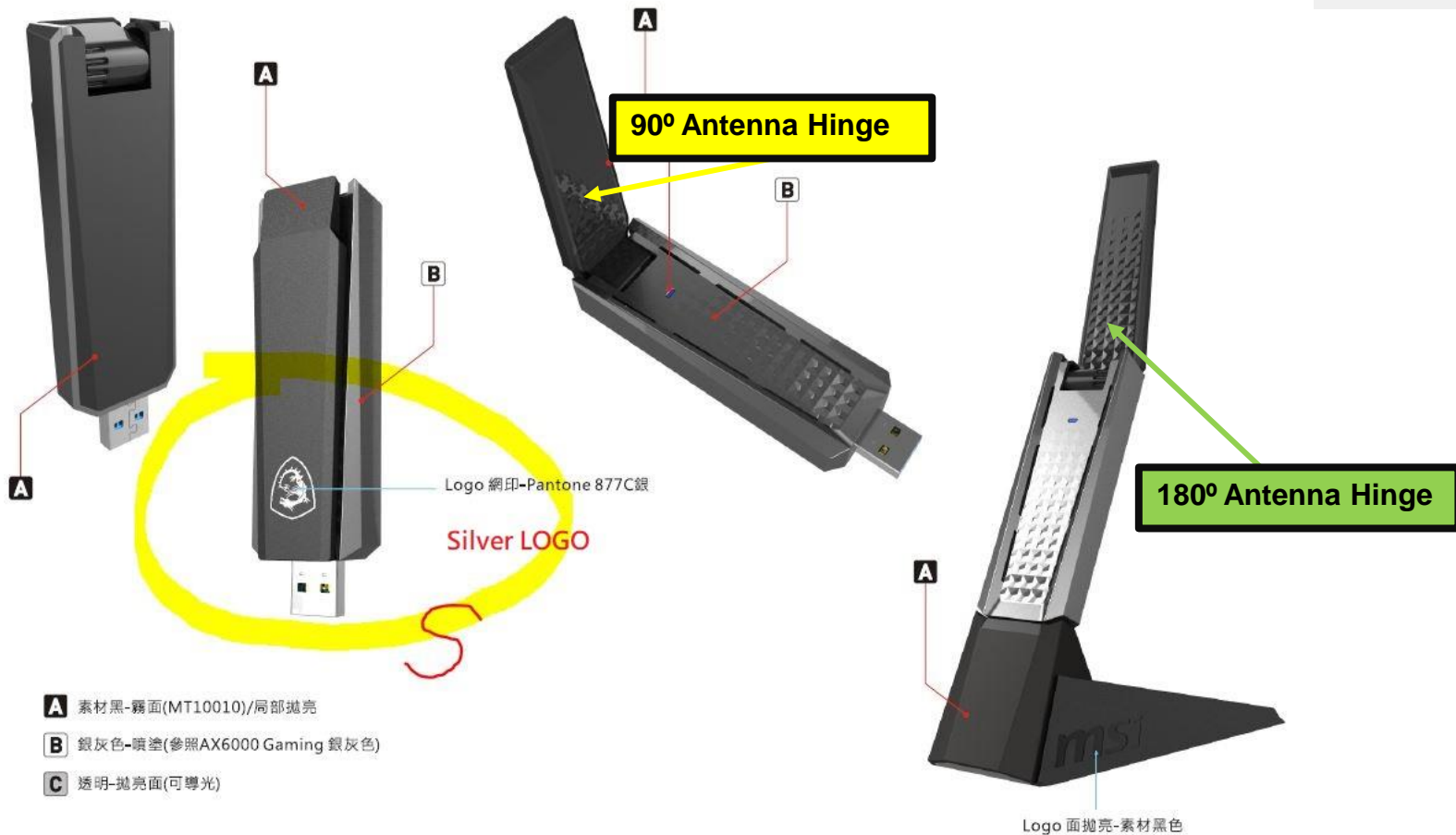
- (2) Dual band Wi-Fi Antenna, off board PCB cabled

# Requirements Wi-Fi

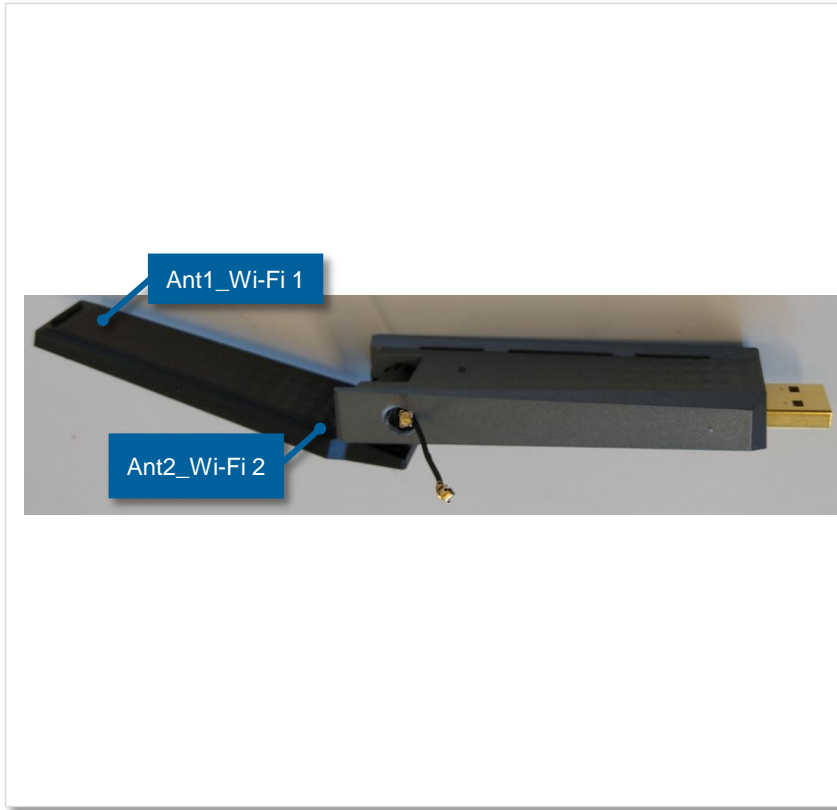
- Frequency bands: 2.4 to 2.49 GHz and 5.15 to 5.85 GHz
- Return Loss requirement  $< -12\text{dB}$
- Isolation Requirement  $< -20\text{dB}$
- Peak Gain 3dBi for Wi-Fi low band and 4dBi for Wi-Fi high band
- Efficiency  $> 50\%$

Not Practical to achieve in current ID

# Antenna Hinge Measurement Angles

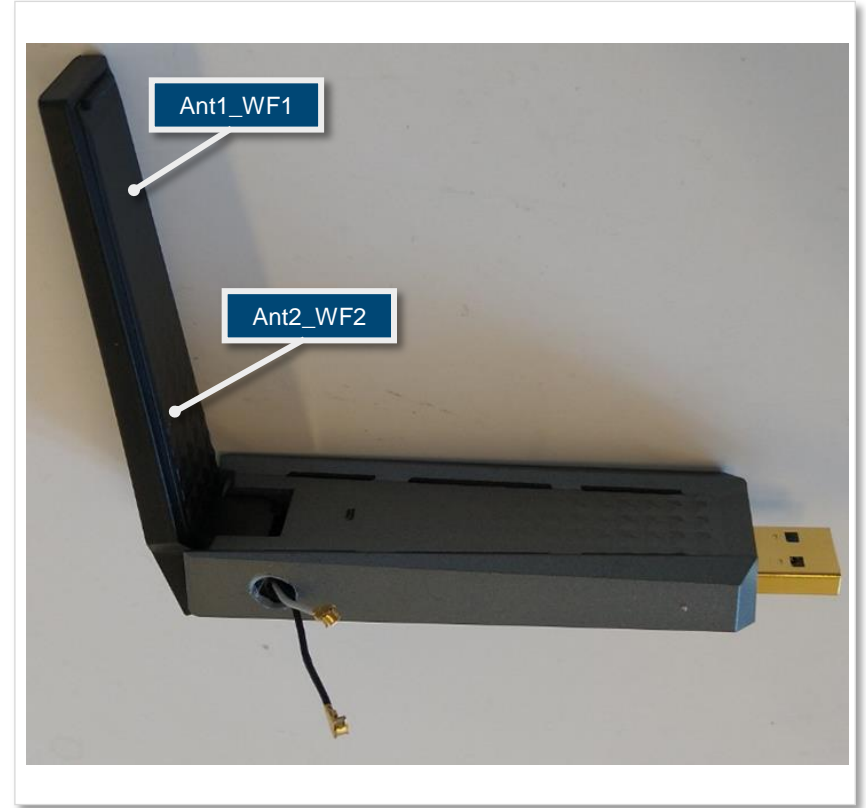
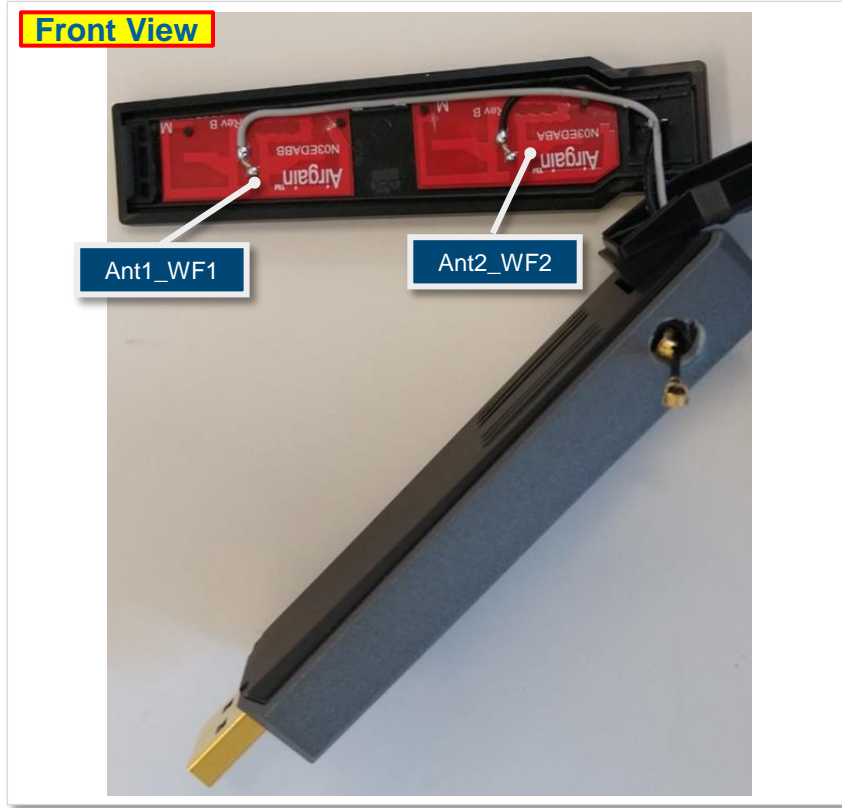


# Antenna Configuration



Antenna #	Part Number
Ant1_Wi-Fi	N03EDABB
Ant2_Wi-Fi	N03EDABA

# Antenna Configuration Mockup





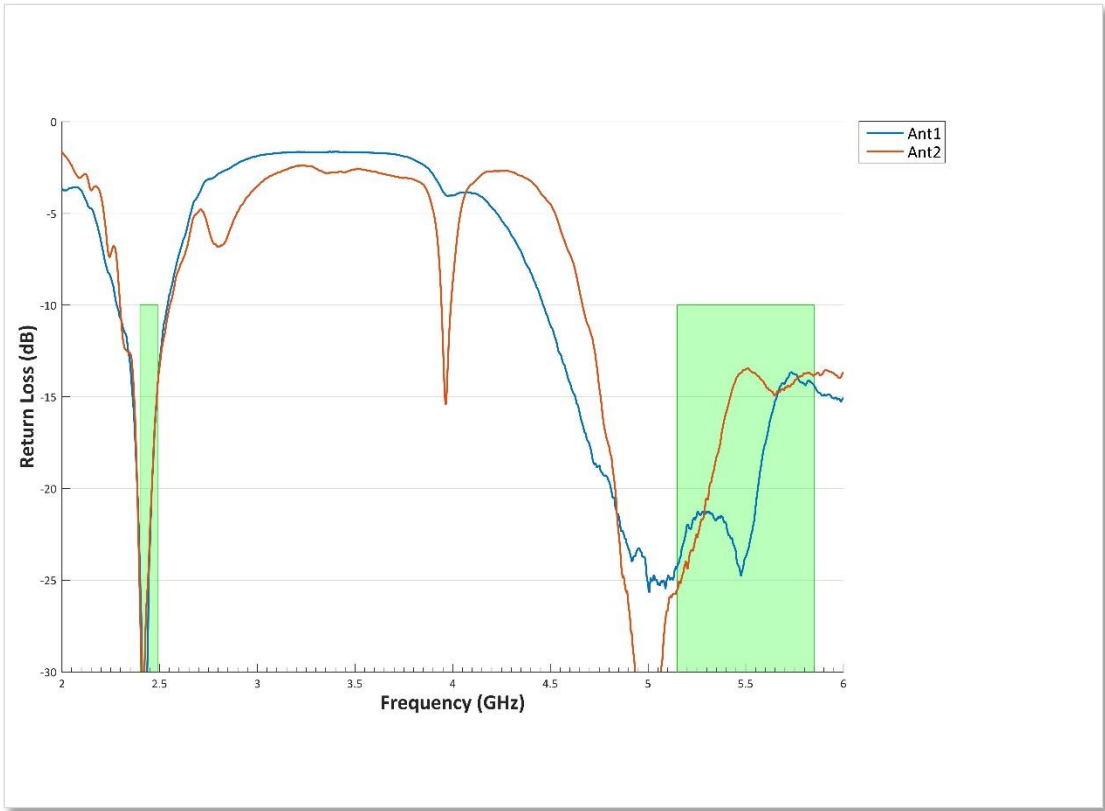
## 180° Antenna Hinge





## S-Parameters Return Loss, Isolation

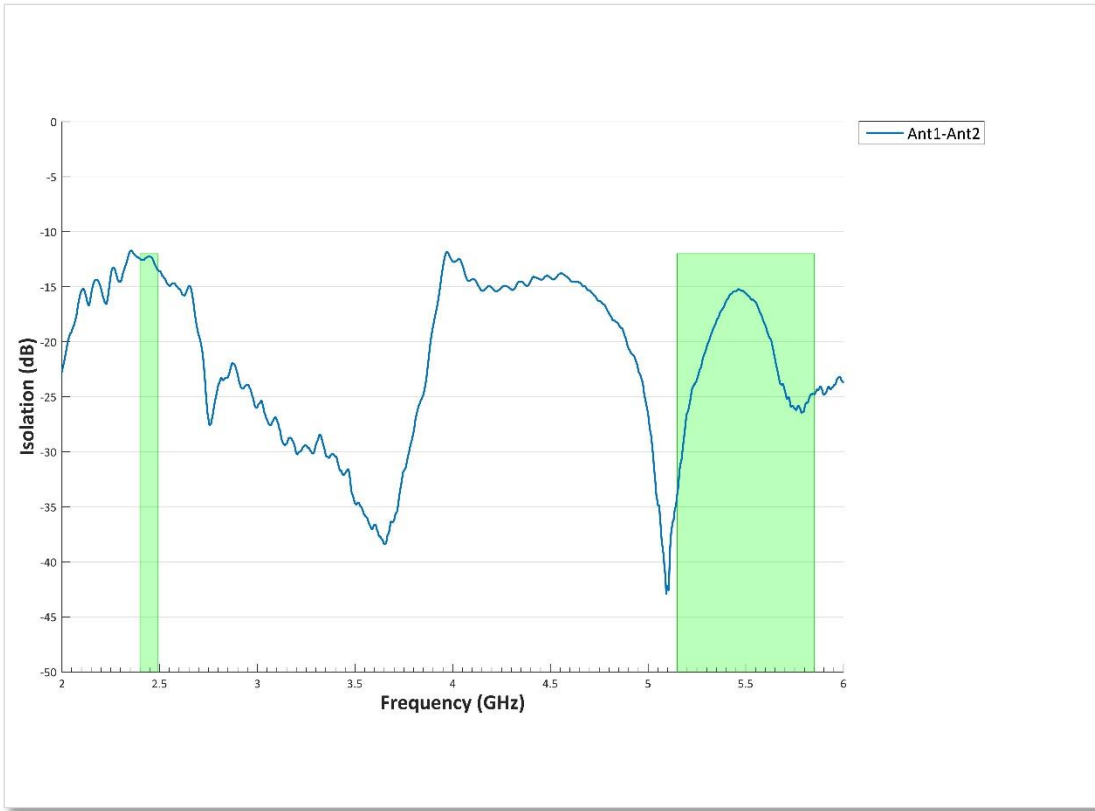
# S-Parameter – Return Loss for Wi-Fi Antennas



### KEY OBSERVATIONS

Antenna	Return Loss (dB)			
	2.4 GHz	2.49 GHz	5.15 GHz	5.85 GHz
Ant1	-24.5	-14.4	-24.2	-14.4
Ant2	-26.5	-14.4	-25.5	-13.8

# S-Parameter – Isolation between Wi-Fi Antennas



### KEY OBSERVATIONS

Antenna	Minimum Isolation (dB)	
	2.4-2.49GHz	5.15-5.85 GHz
Ant1-Ant2	-12.8	-15.2





## Efficiency and Peak Gain

# Efficiency of Wi-Fi (%)

Frequency (MHz)	Ant1 Wi-Fi	Ant2 Wi-Fi
2400	69	66
2410	71	69
2420	69	66
2430	69	66
2440	70	67
2450	70	67
2460	70	67
2470	70	66
2480	69	67
2490	70	67
<b>Average</b>	<b>70</b>	<b>67</b>

Frequency (MHz)	Ant1 Wi-Fi	Ant2 Wi-Fi
5150	73	64
5200	83	75
5300	82	77
5400	74	72
5500	68	65
5600	66	64
5700	73	75
5800	70	71
5850	74	74
<b>Average</b>	<b>74</b>	<b>71</b>



# Peak Gain (dBi) of Wi-Fi

Frequency (MHz)	Ant1 Wi-Fi	Ant2 Wi-Fi
2400	2.7	3.1
2410	2.8	3.3
2420	2.6	3
2430	2.5	2.9
2440	2.5	3.1
2450	2.5	3.2
2460	2.4	3.1
2470	2.5	3
2480	2.3	3
2490	2.3	3.1

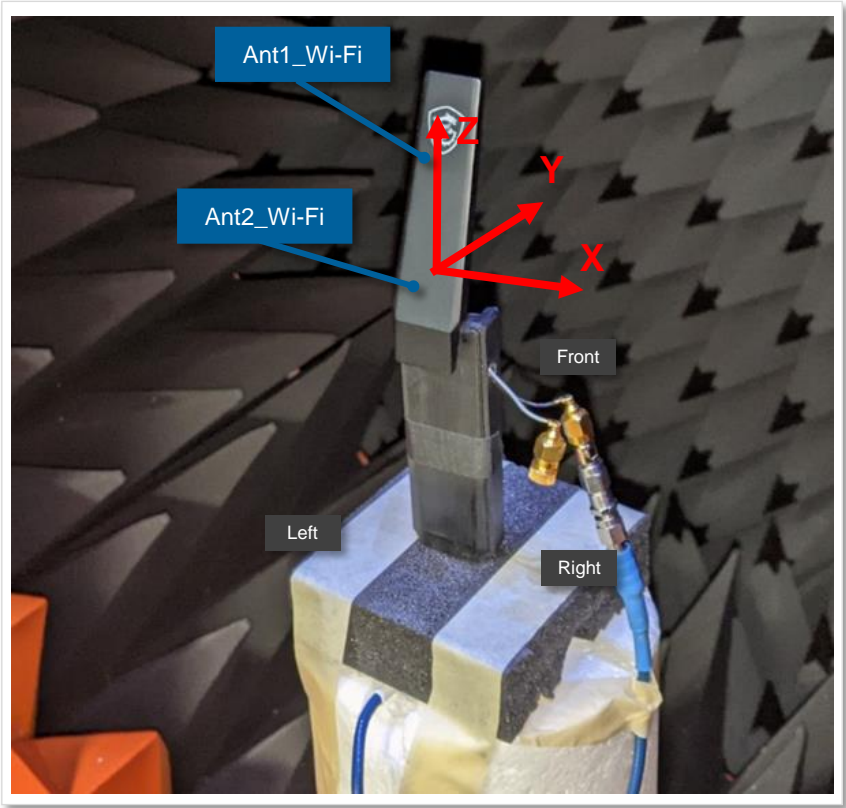
Frequency (MHz)	Ant1 Wi-Fi	Ant2 Wi-Fi
5150	3.6	3.8
5200	4.4	4.5
5300	4	4.5
5400	3.9	4
5500	2.9	3
5600	2.7	2.7
5700	3	3.9
5800	2.7	3.4
5850	3.5	3.8





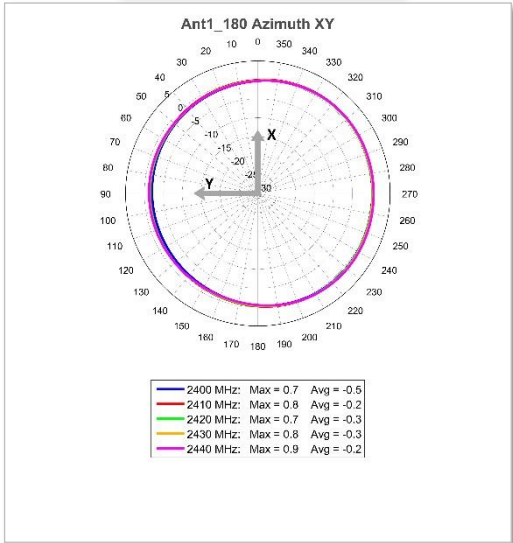
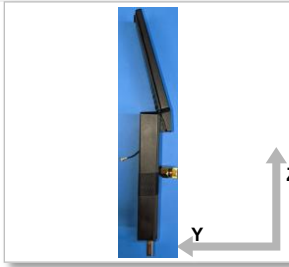
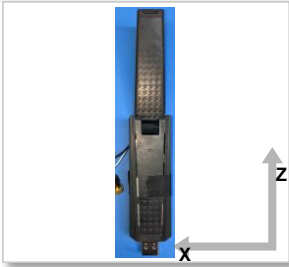
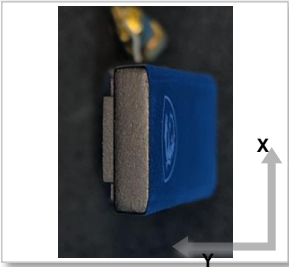
## Radiation Patterns

# Coordinate System for Radiation Patterns

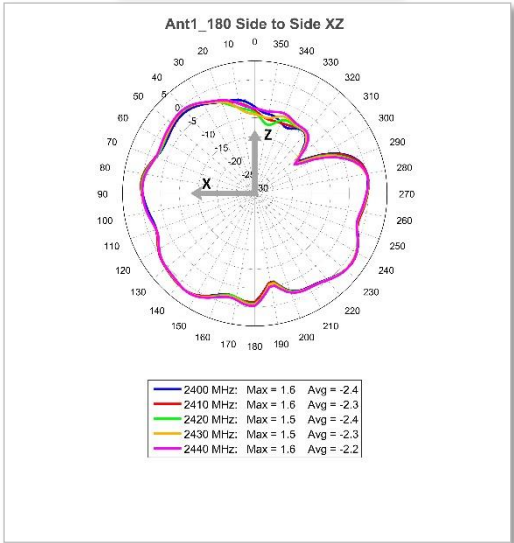




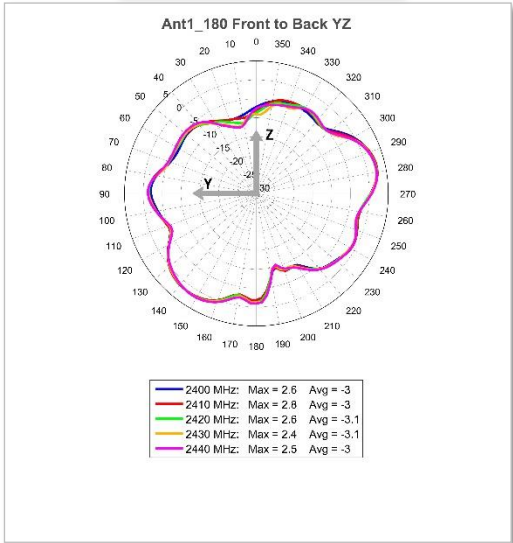
# Wi-Fi 2.4GHz Radiation Pattern for Ant1



Azimuth



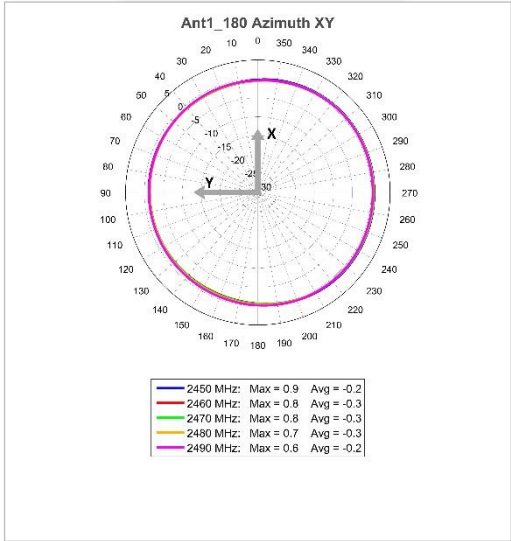
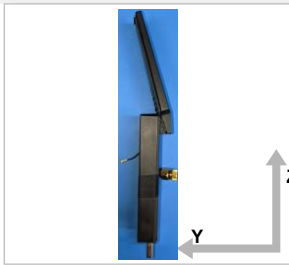
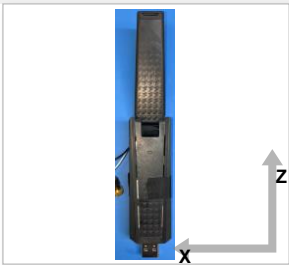
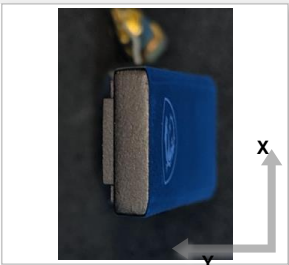
Side to Side Elevation



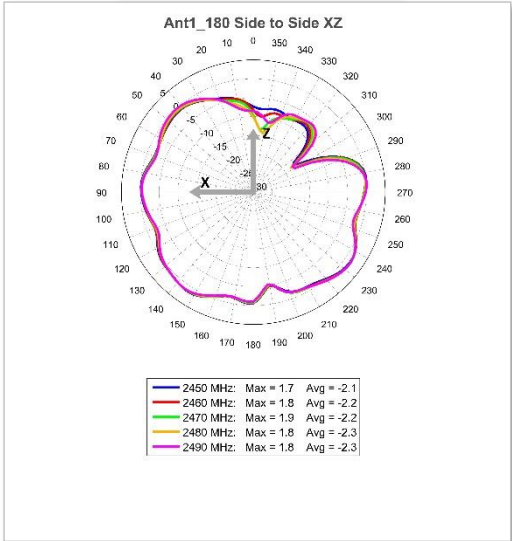
Front to Back Elevation



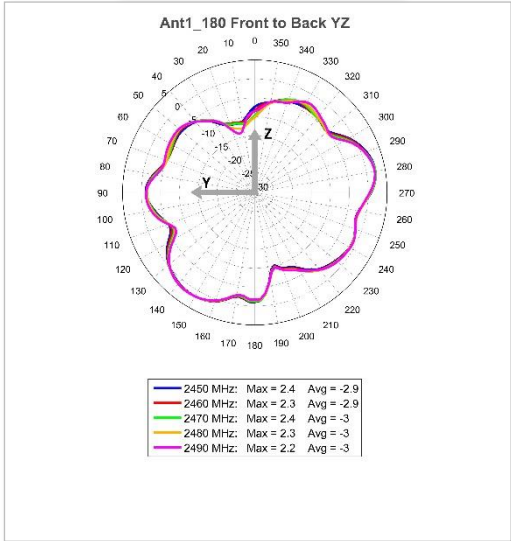
# Wi-Fi 2.4GHz Radiation Pattern for Ant1



Azimuth



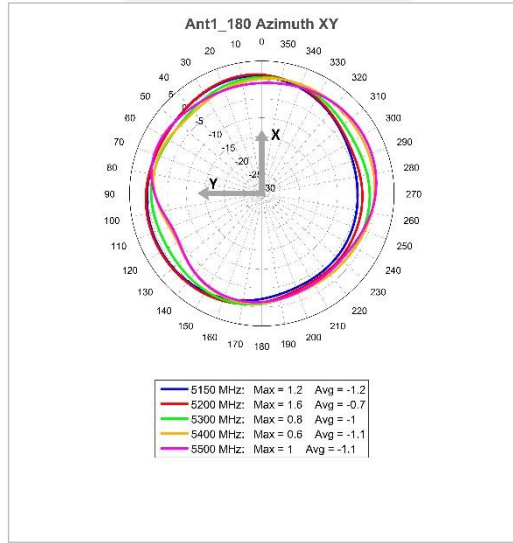
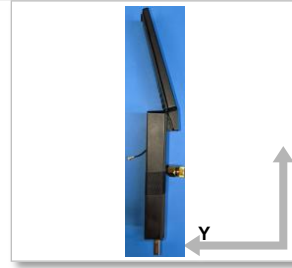
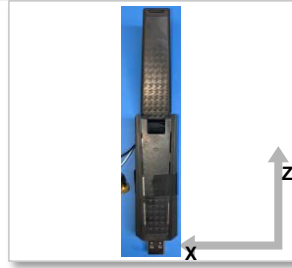
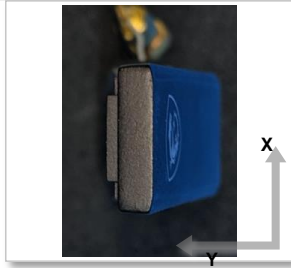
Side to Side Elevation



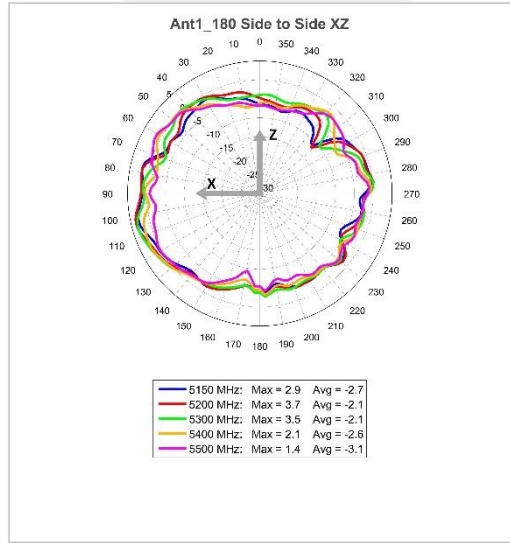
Front to Back Elevation



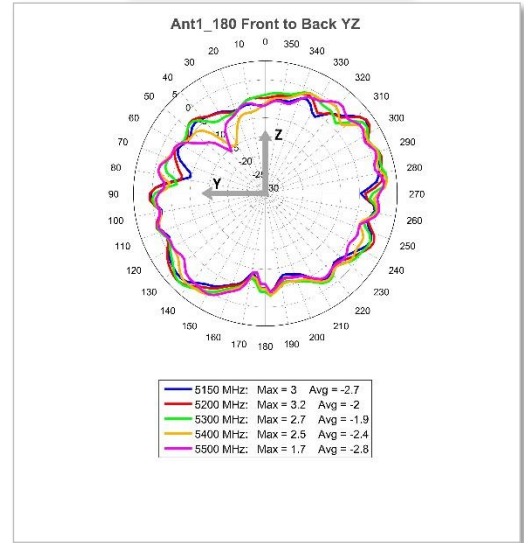
# Wi-Fi 5GHz Radiation Pattern for Ant1



Azimuth

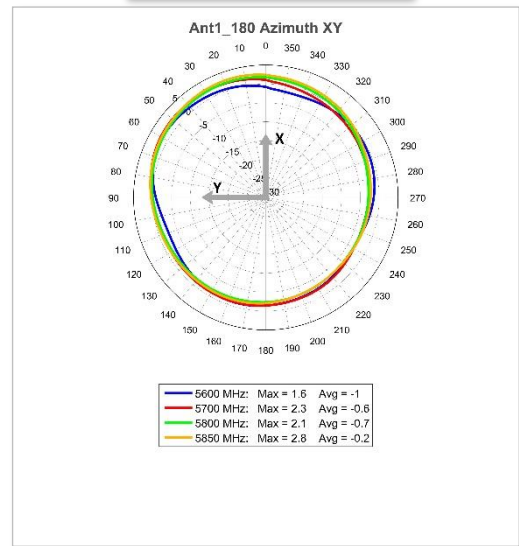
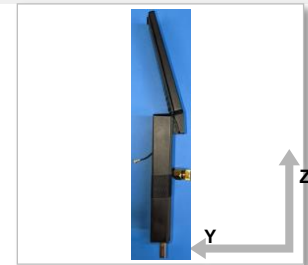
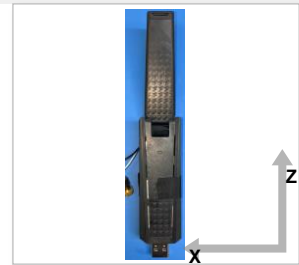


Side to Side Elevation

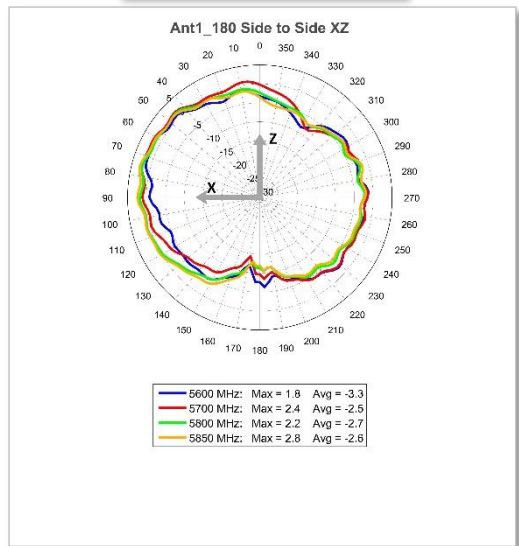


Front to Back Elevation

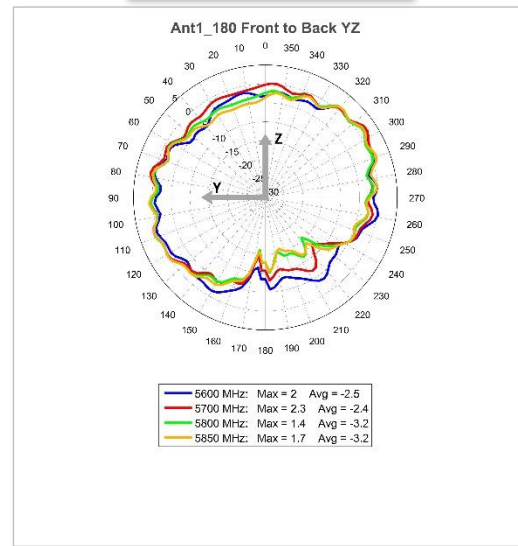
# Wi-Fi 5GHz Radiation Pattern for Ant1



Azimuth



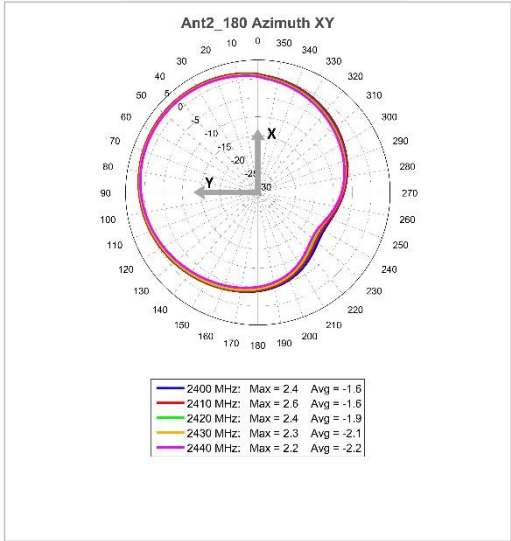
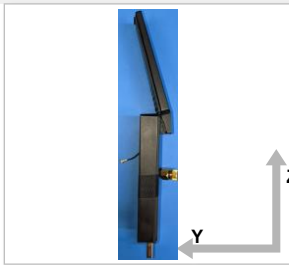
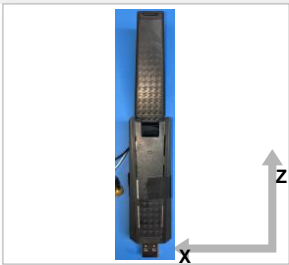
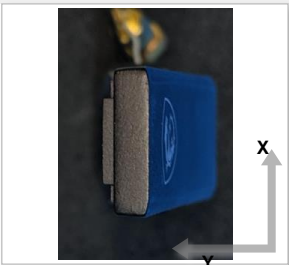
Side to Side Elevation



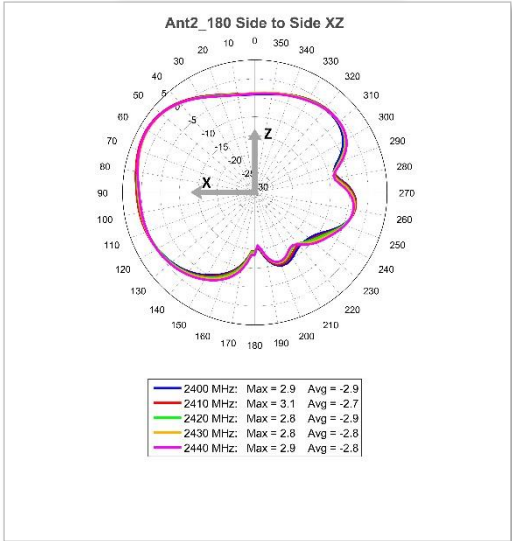
Front to Back Elevation



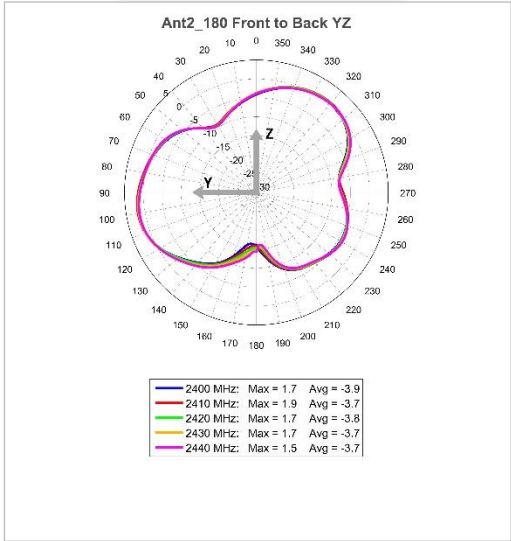
# Wi-Fi 2.4GHz Radiation Pattern for Ant2



Azimuth

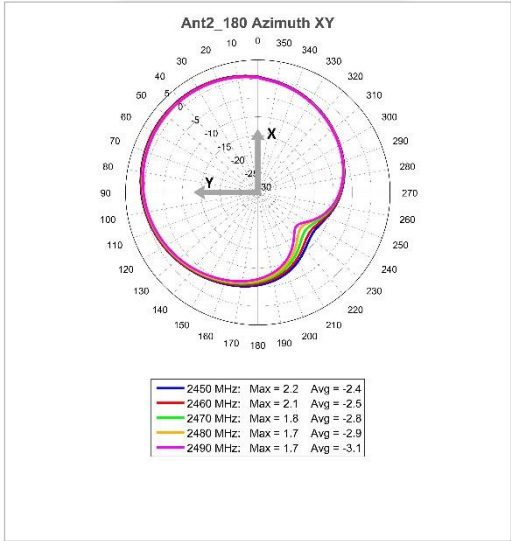
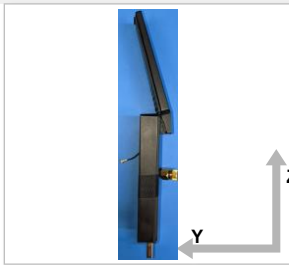
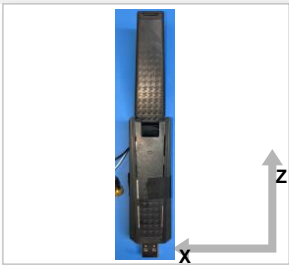
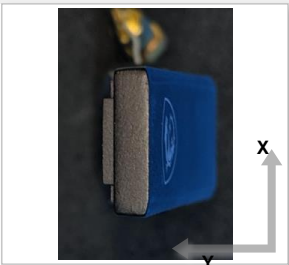


Side to Side Elevation

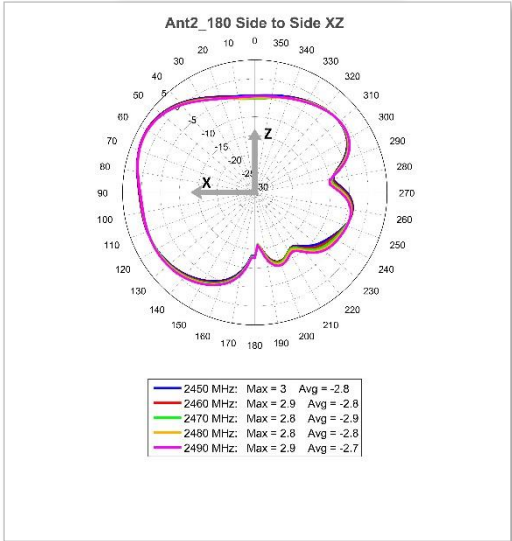


Front to Back Elevation

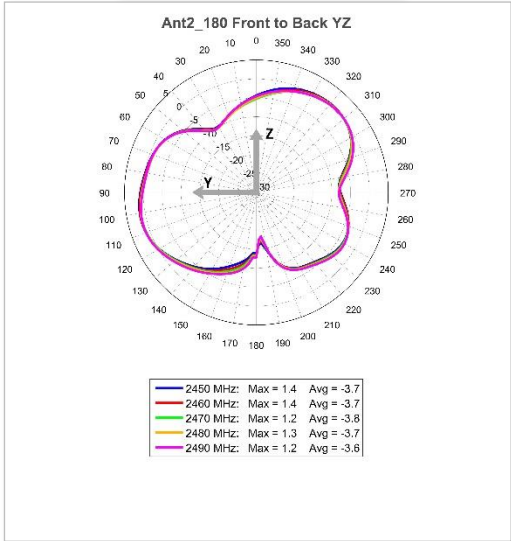
# Wi-Fi 2.4GHz Radiation Pattern for Ant2



Azimuth

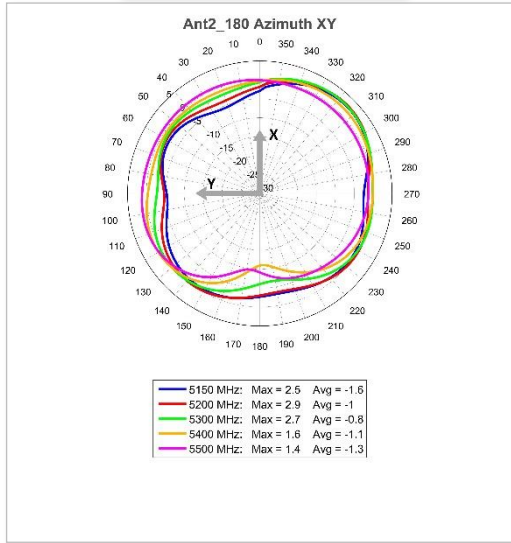
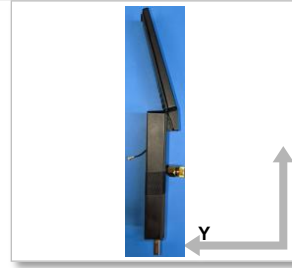
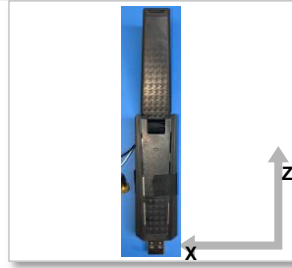
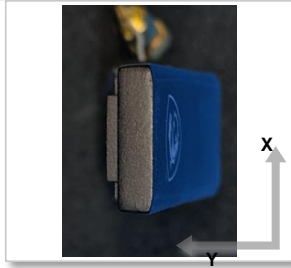


Side to Side Elevation

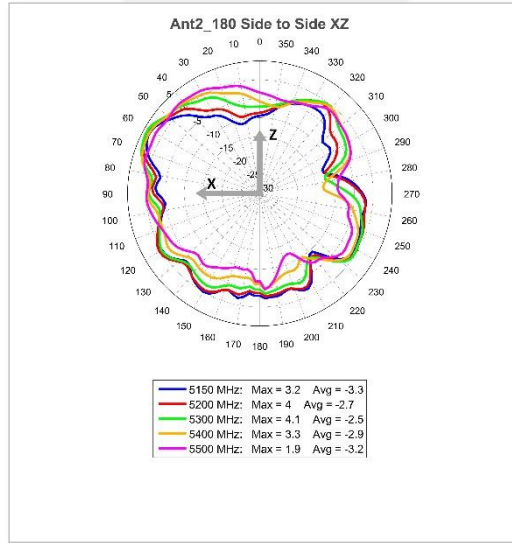


Front to Back Elevation

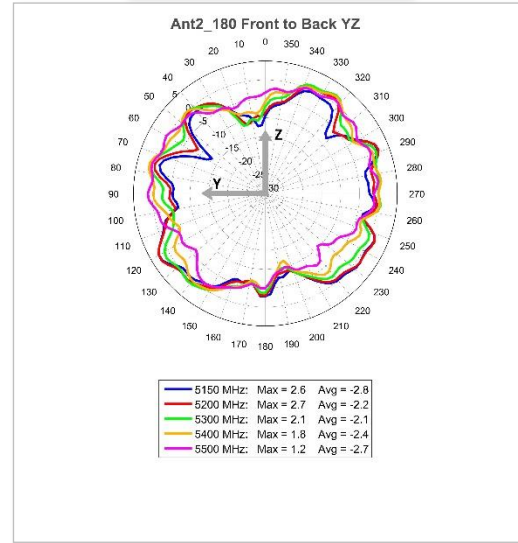
# Wi-Fi 5GHz Radiation Pattern for Ant2



Azimuth

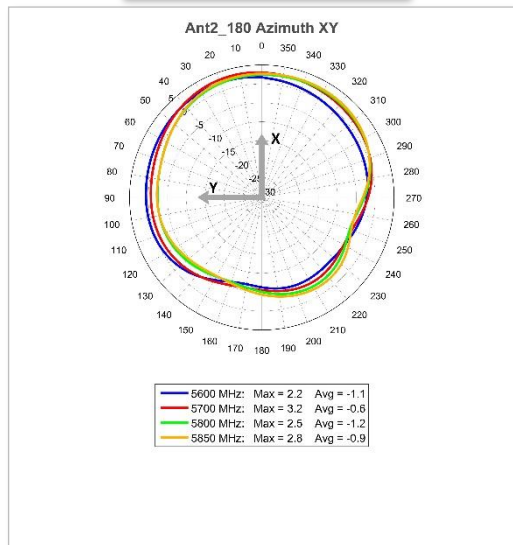
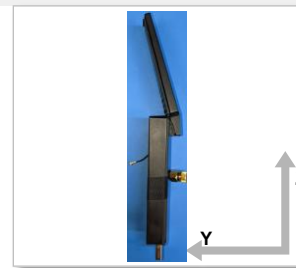
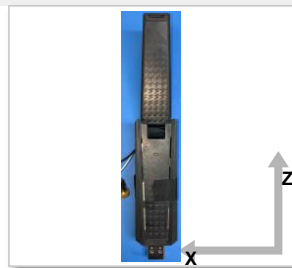


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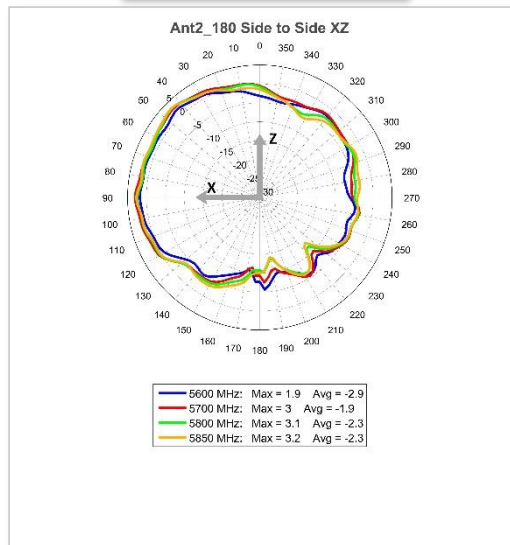


Front to Back Elevation

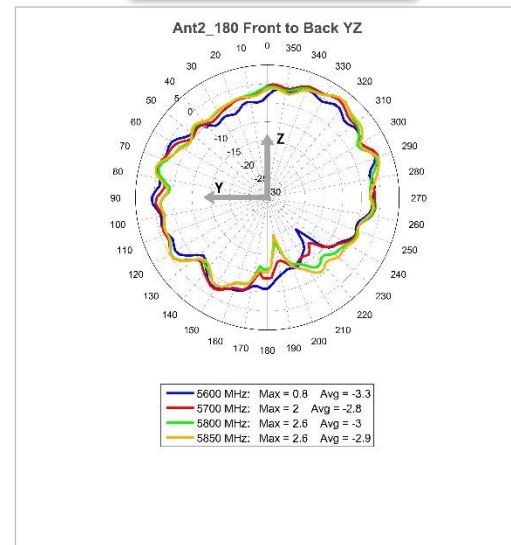
# Wi-Fi 5GHz Radiation Pattern for Ant2



Azimuth



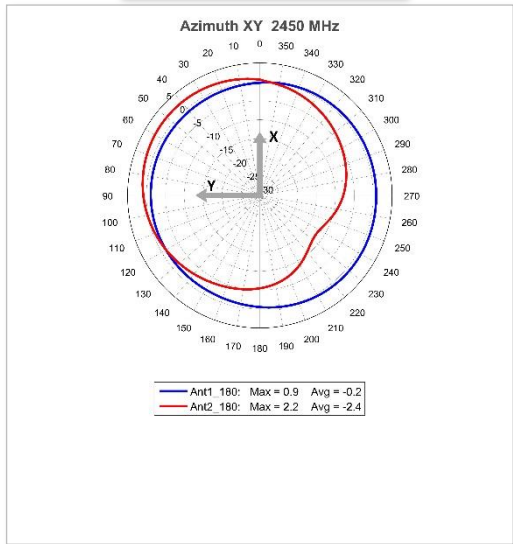
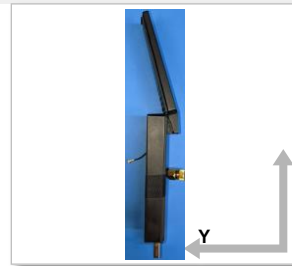
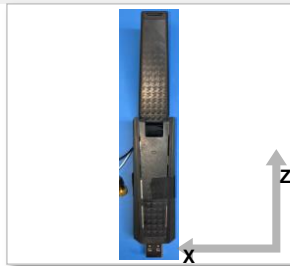
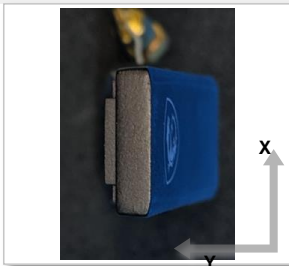
Side to Side Elevation



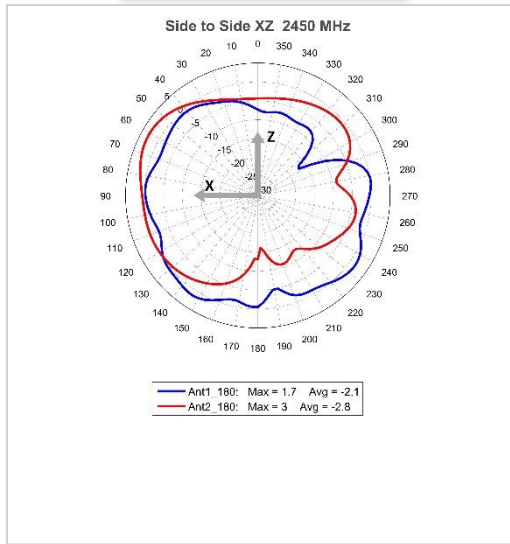
Front to Back Elevation



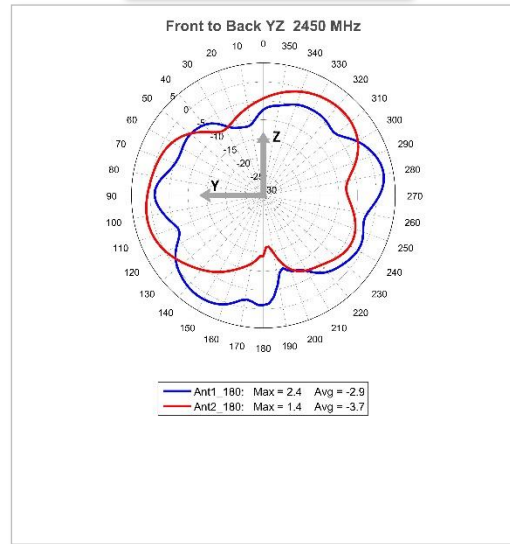
# System Coverage: Wi-Fi 2.44 GHz



Azimuth

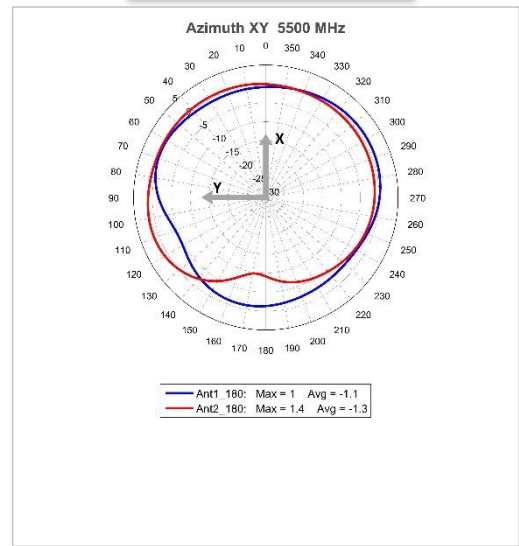
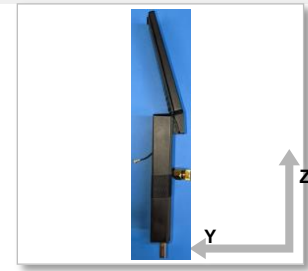
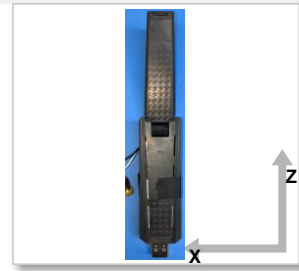
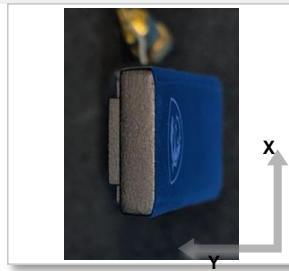


Side to Side Elevation

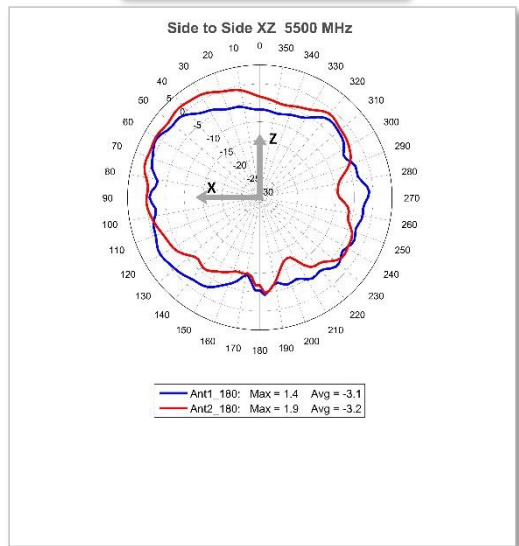


Front to Back Elevation

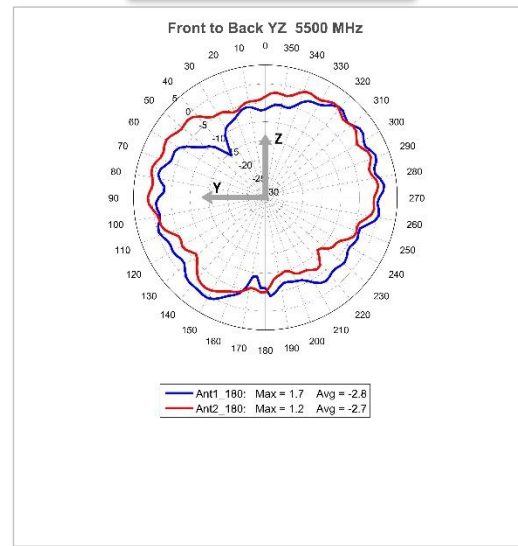
# System Coverage: Wi-Fi 5.5 GHz



Azimuth



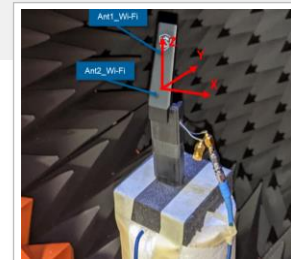
Side to Side Elevation



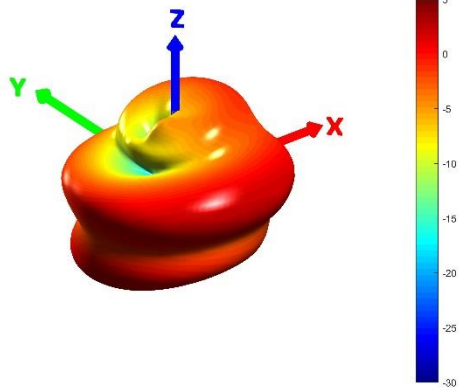
Front to Back Elevation



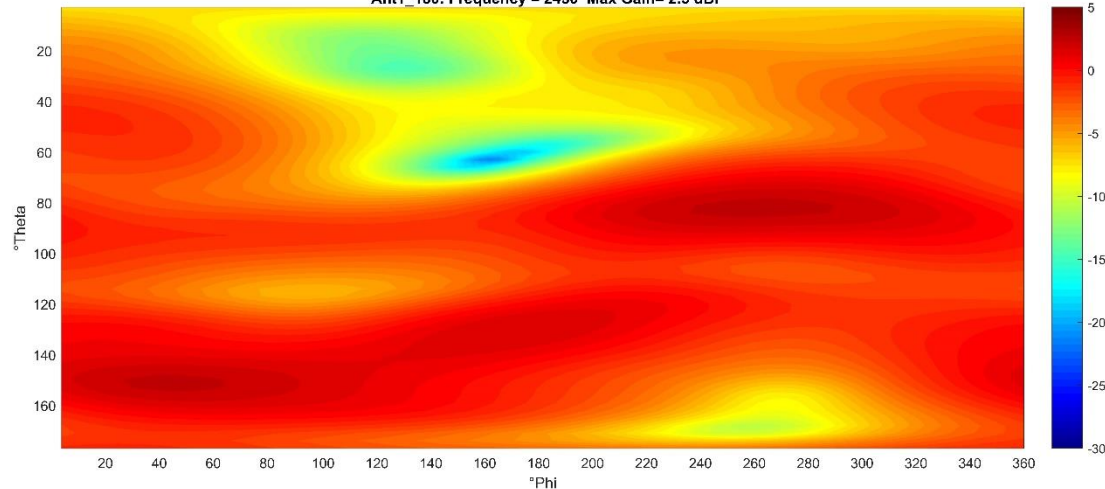
# 3D Pattern – Ant 1 at 2.45 GHz



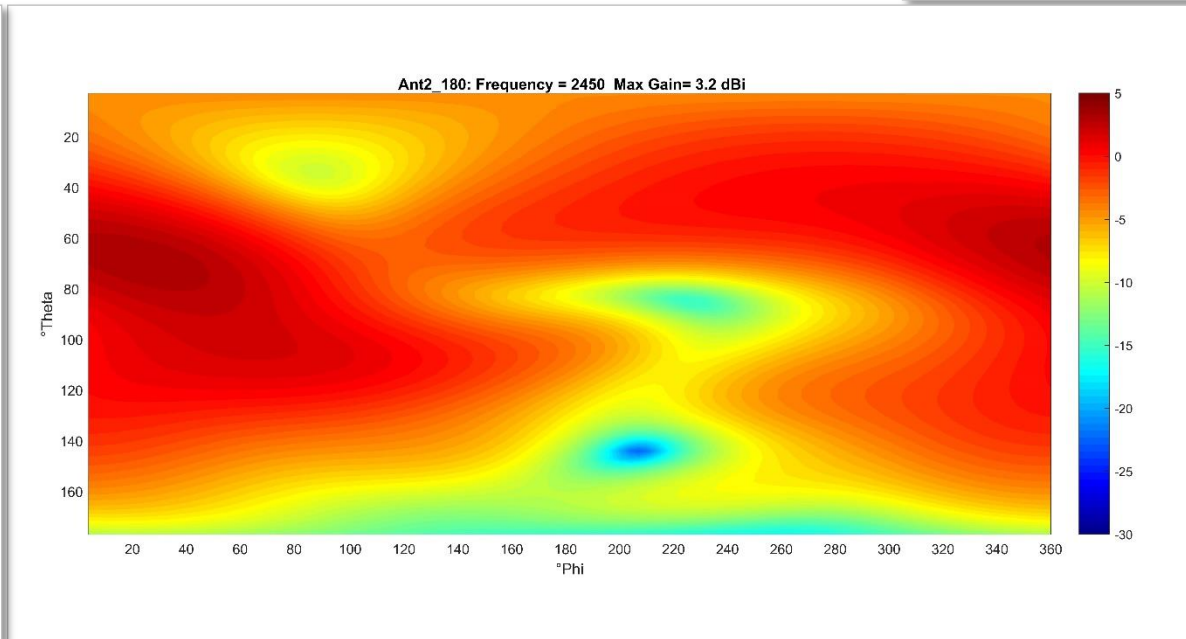
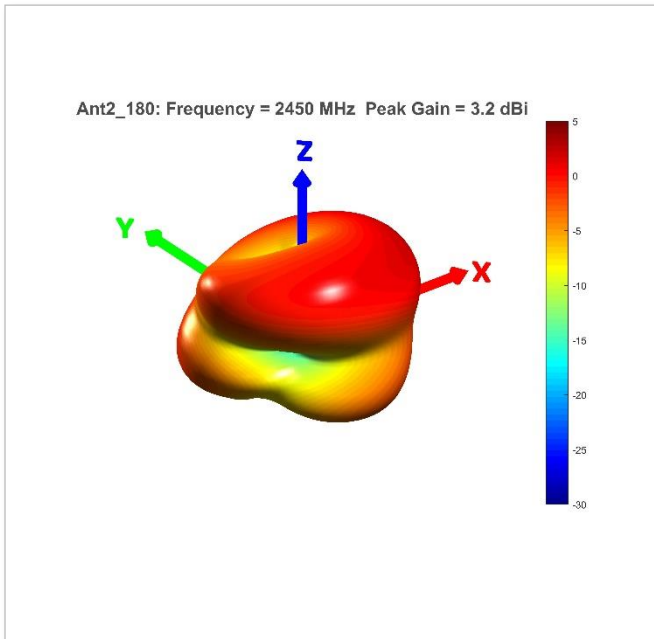
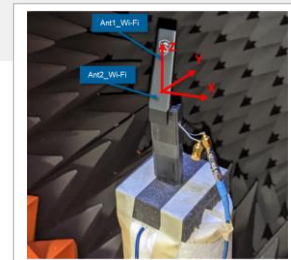
Ant1\_180: Frequency = 2450 MHz Peak Gain = 2.5 dBi



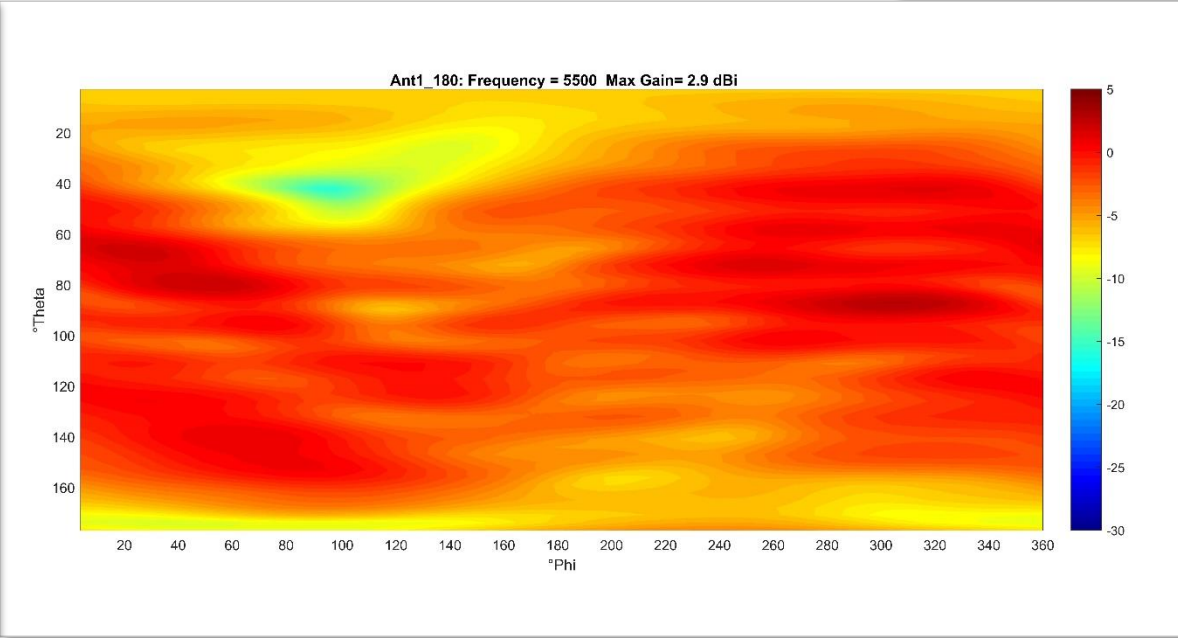
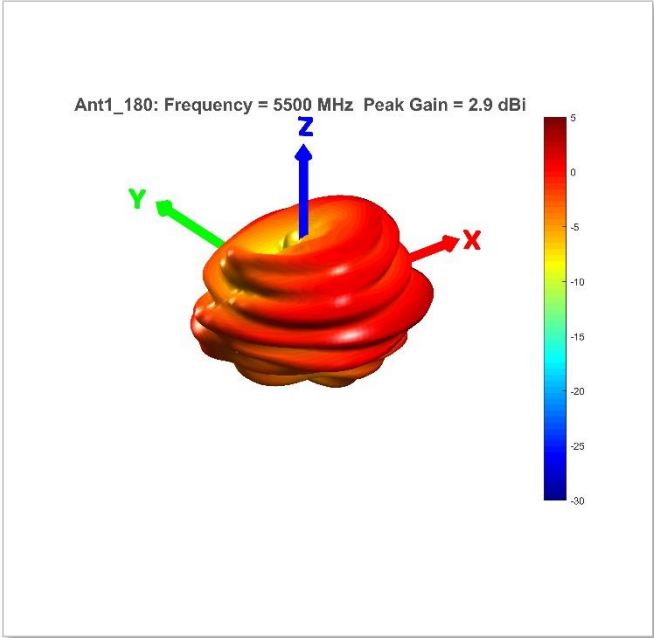
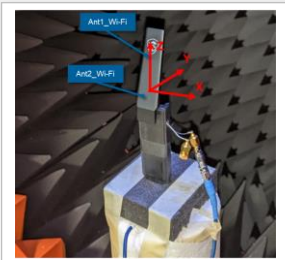
Ant1\_180: Frequency = 2450 Max Gain= 2.5 dBi



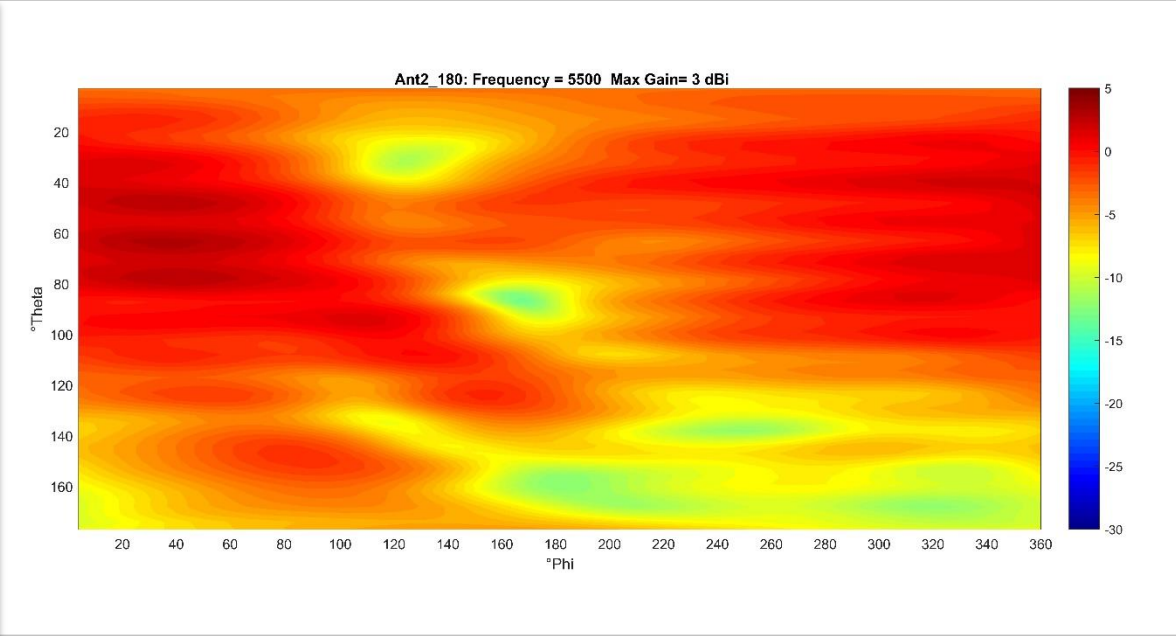
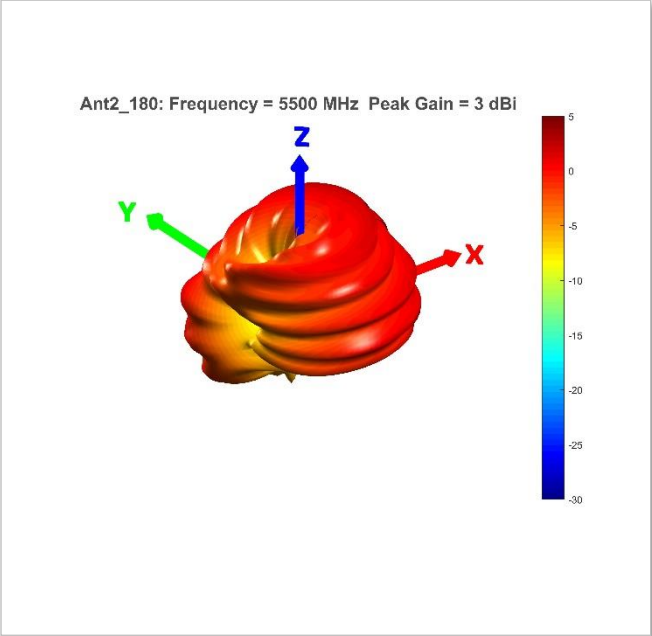
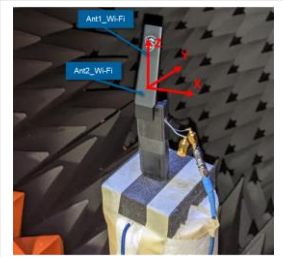
# 3D Pattern – Ant 2 at 2.45 GHz



# 3D Pattern – Ant 1 at 5.5 GHz



# 3D Pattern – Ant 2 at 5.5 GHz



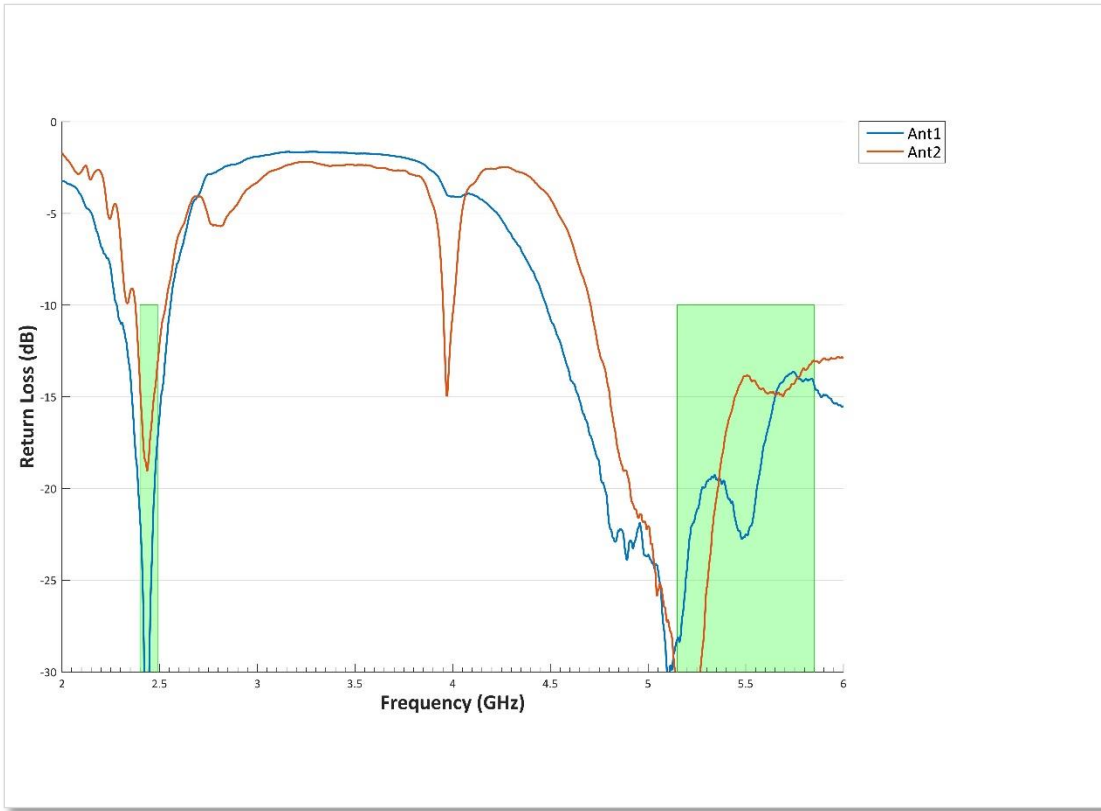
## 90° Antenna Hinge



## S-Parameters Return Loss, Isolation



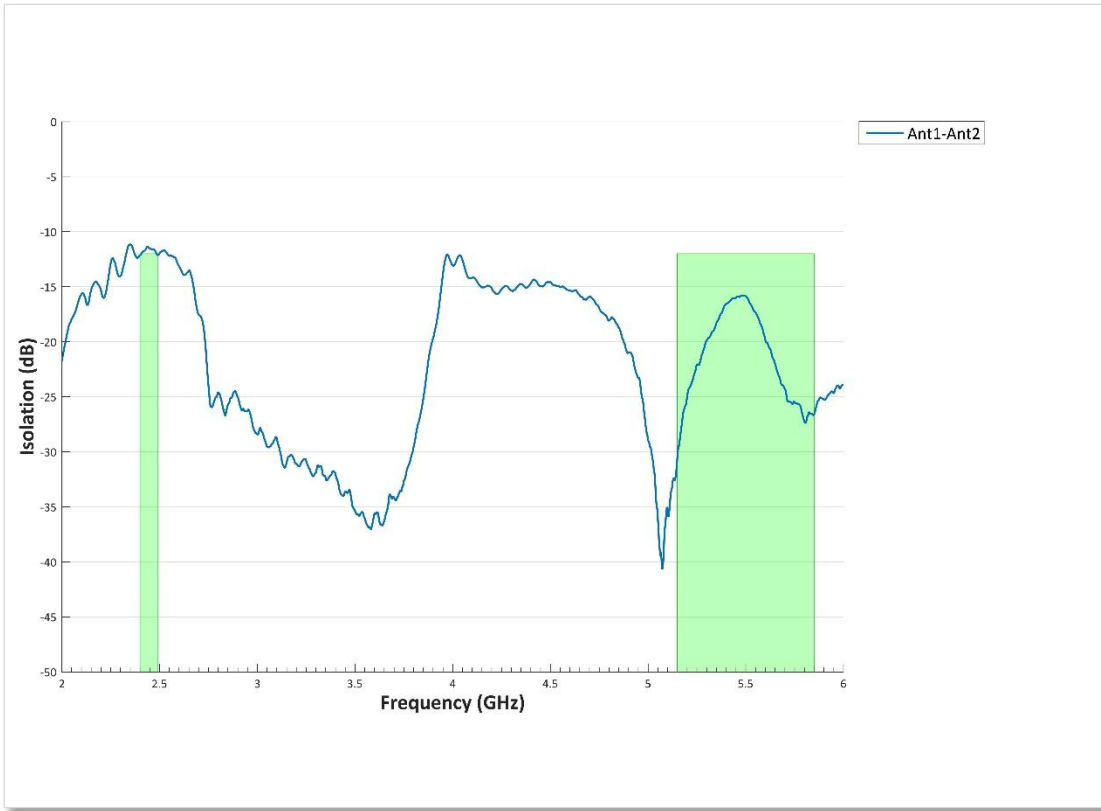
# S-Parameter – Return Loss for Wi-Fi Antennas



## KEY OBSERVATIONS

Antenna	Return Loss (dB)			
	2.4 GHz	2.49 GHz	5.15 GHz	5.85 GHz
Ant1	-21.6	-17.4	-28.2	-14.3
Ant2	-14.3	-13.6	-31.4	-13

# S-Parameter – Isolation between Wi-Fi Antennas



### KEY OBSERVATIONS

Antenna	Minimum Isolation (dB)	
	2.4-2.49GHz	5.15-5.85 GHz
Ant1-Ant2	-11.9	-15.8



## Efficiency and Peak Gain

# Efficiency of Wi-Fi (%)

Frequency (MHz)	Ant1 Wi-Fi	Ant2 Wi-Fi
2400	70	68
2410	73	71
2420	71	68
2430	70	68
2440	72	69
2450	72	71
2460	72	71
2470	71	68
2480	69	68
2490	69	68
<b>Average</b>	<b>71</b>	<b>69</b>

Frequency (MHz)	Ant1 Wi-Fi	Ant2 Wi-Fi
5150	72	72
5200	82	82
5300	82	82
5400	75	73
5500	66	64
5600	62	63
5700	70	72
5800	69	67
5850	71	69
<b>Average</b>	<b>72</b>	<b>72</b>



# Peak Gain (dBi) of Wi-Fi

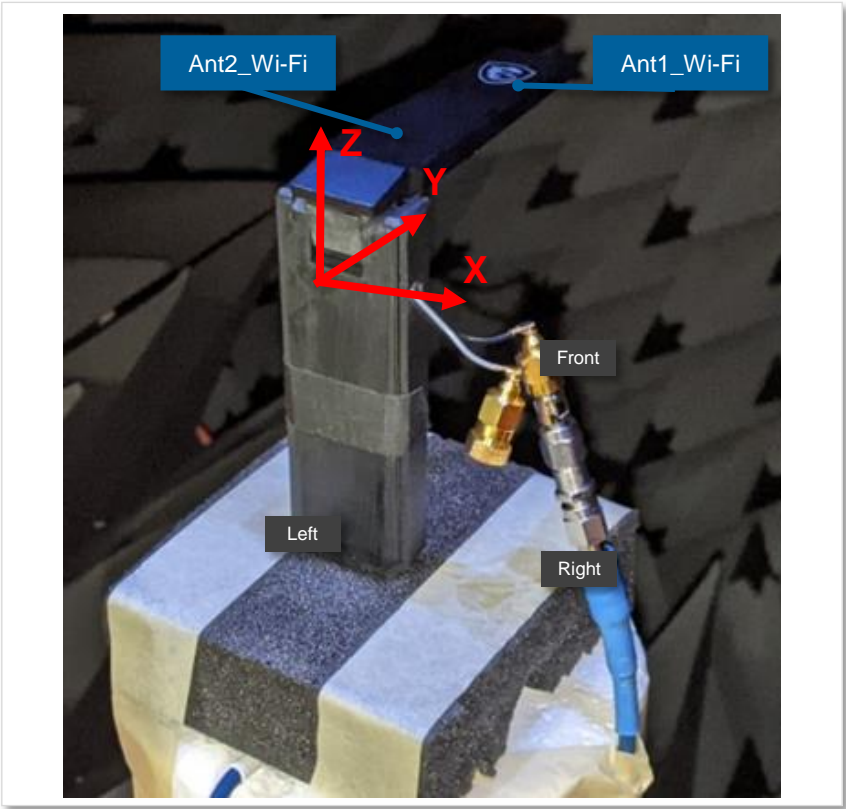
Frequency (MHz)	Ant1 Wi-Fi	Ant2 Wi-Fi
2400	3	3.1
2410	3.3	3
2420	3.1	3.2
2430	2.6	4.4
2440	2.7	4.5
2450	2.8	3.7
2460	2.7	3.7
2470	2.6	3.3
2480	2.5	3
2490	2.5	2.9

Frequency (MHz)	Ant1 Wi-Fi	Ant2 Wi-Fi
5150	4.3	3.9
5200	4.2	4.2
5300	4.1	4
5400	3.5	3.7
5500	2.8	4
5600	3	3.7
5700	3.5	5.4
5800	3.4	4.9
5850	3.6	5

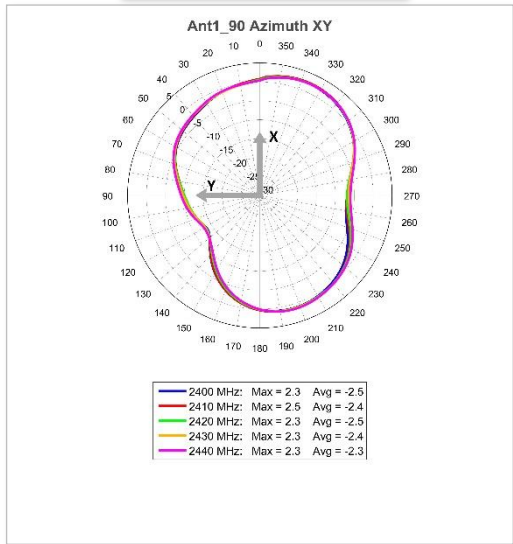
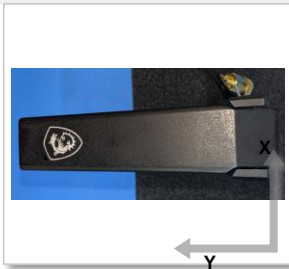


## Radiation Patterns

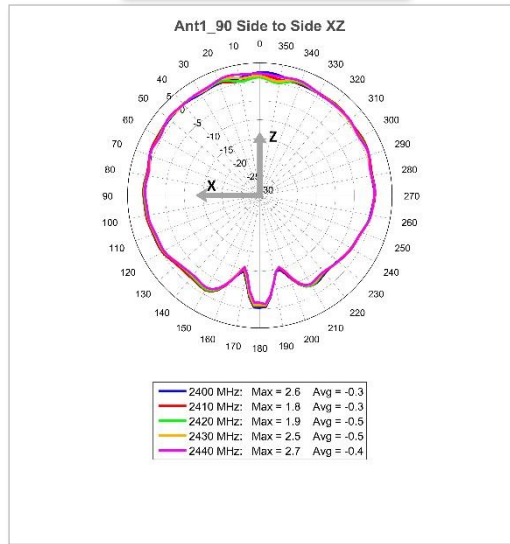
# Coordinate System for Radiation Patterns



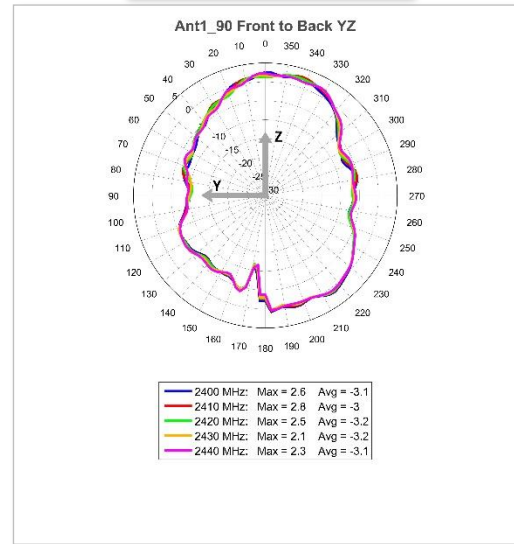
# Wi-Fi 2.4GHz Radiation Pattern for Ant1



Azimuth



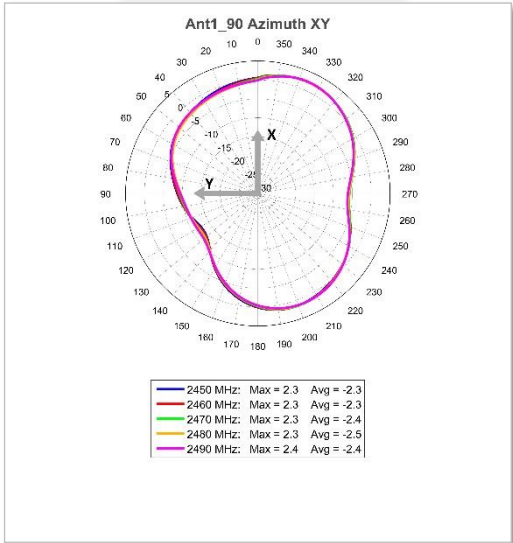
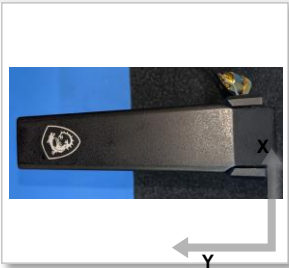
Side to Side Elevation



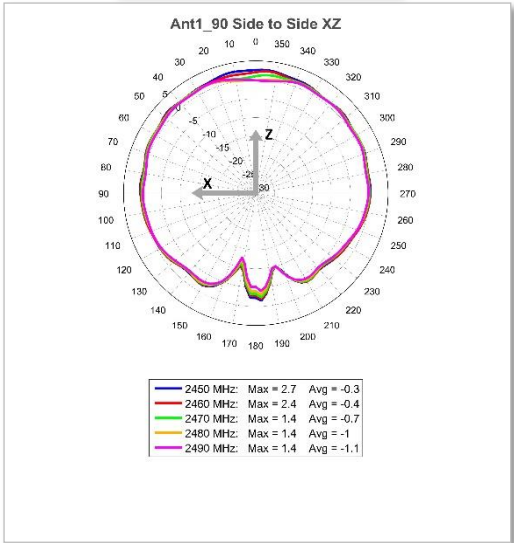
Front to Back Elevation



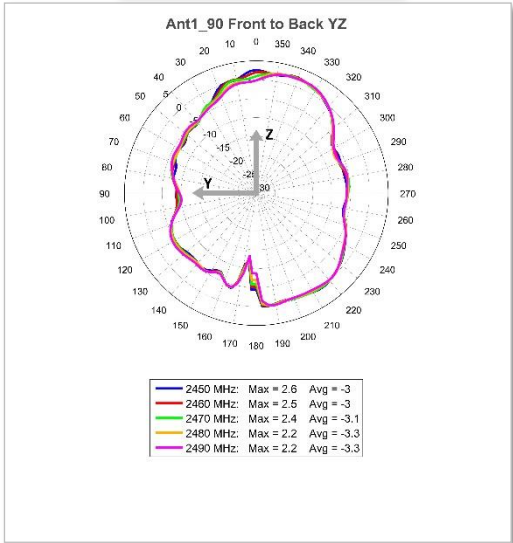
# Wi-Fi 2.4GHz Radiation Pattern for Ant1



Azimuth

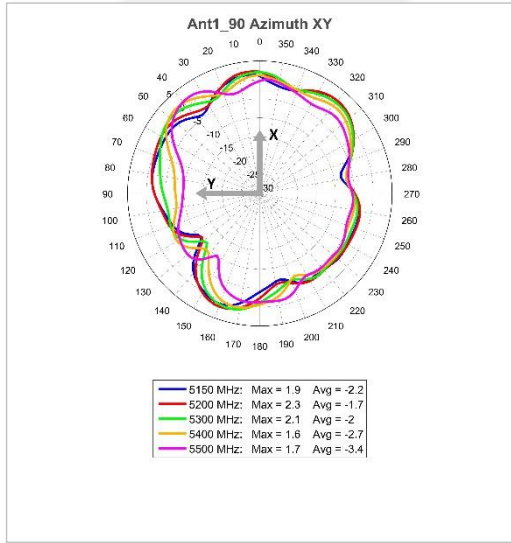
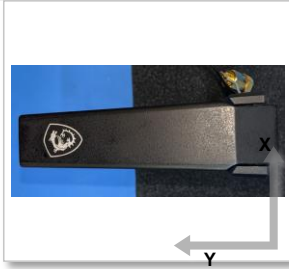


Side to Side Elevation

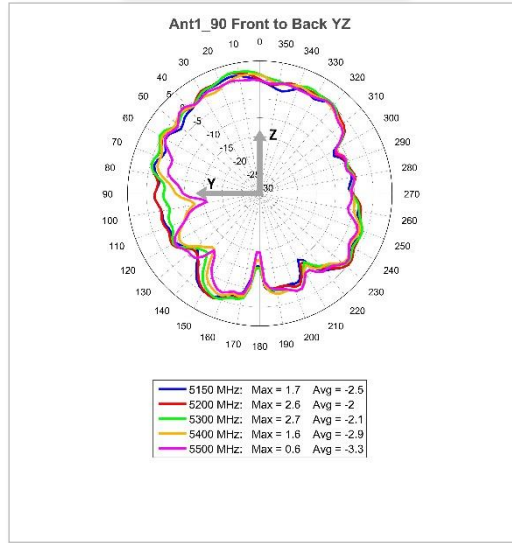


Front to Back Elevation

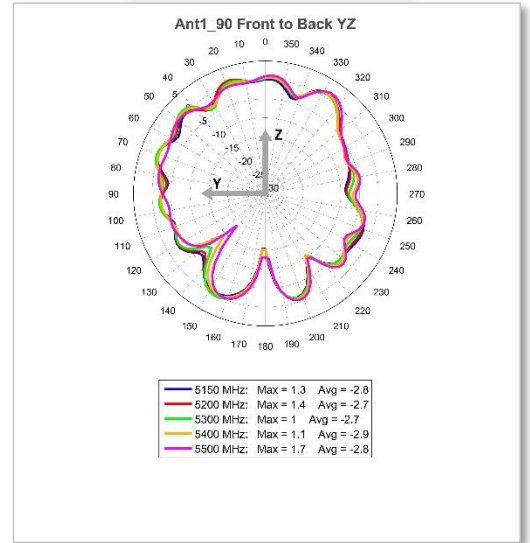
# Wi-Fi 5GHz Radiation Pattern for Ant1



Azimuth

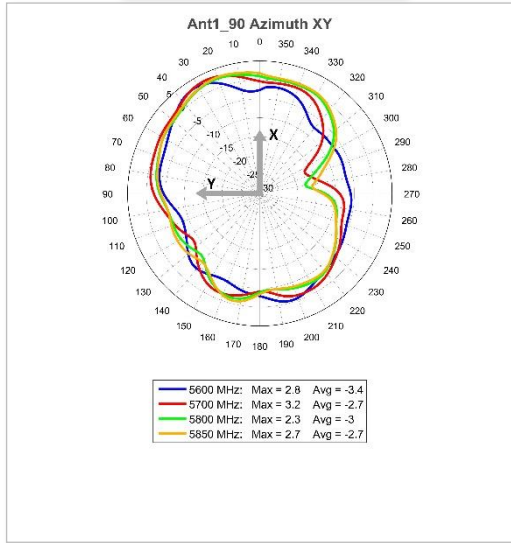
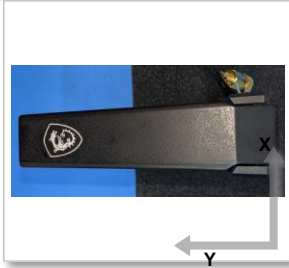


Side to Side Elevation

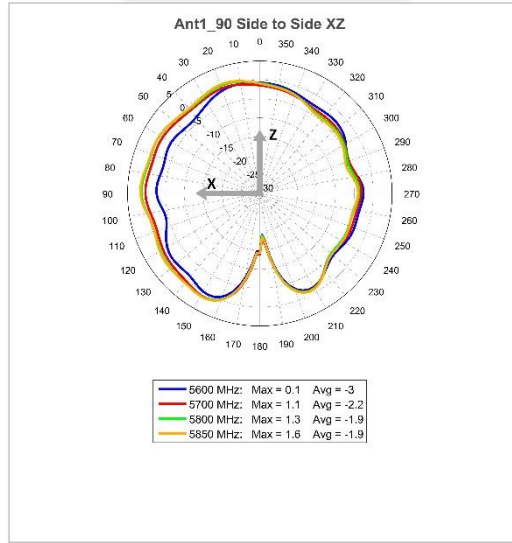


Front to Back Elevation

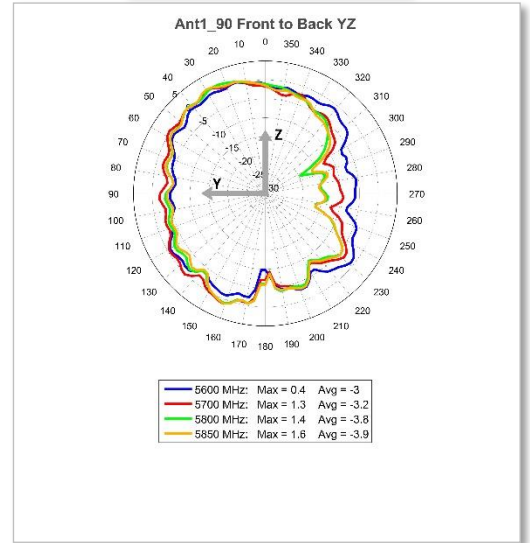
# Wi-Fi 5GHz Radiation Pattern for Ant1



Azimuth

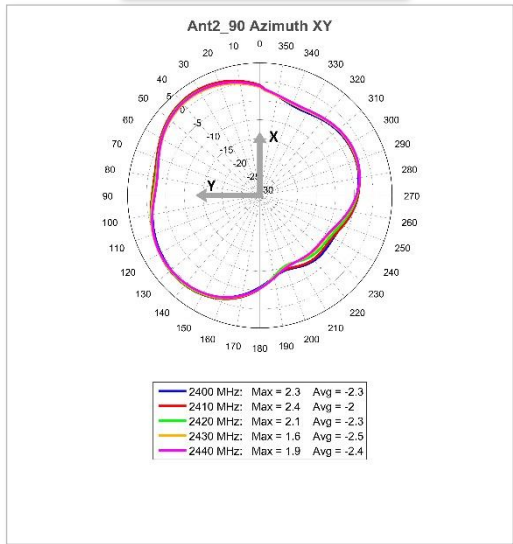
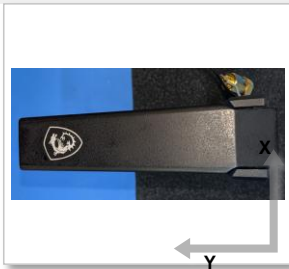


Side to Side Elevation

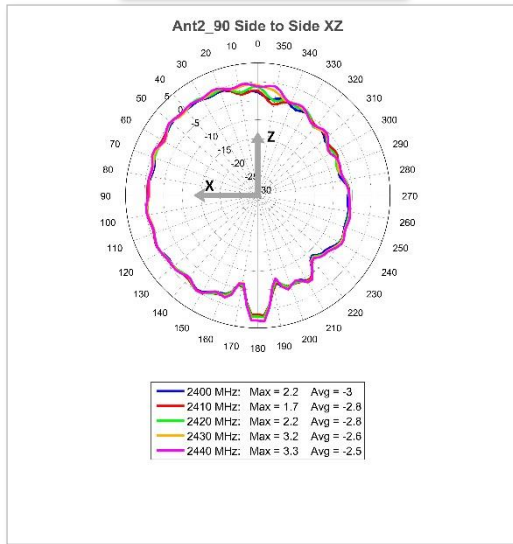


Front to Back Elevation

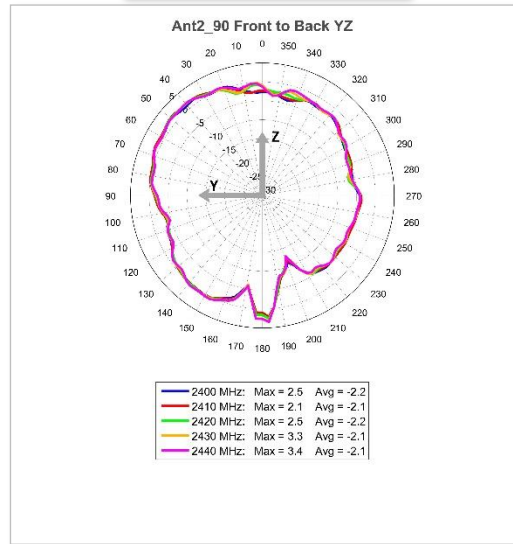
# Wi-Fi 2.4GHz Radiation Pattern for Ant2



Azimuth

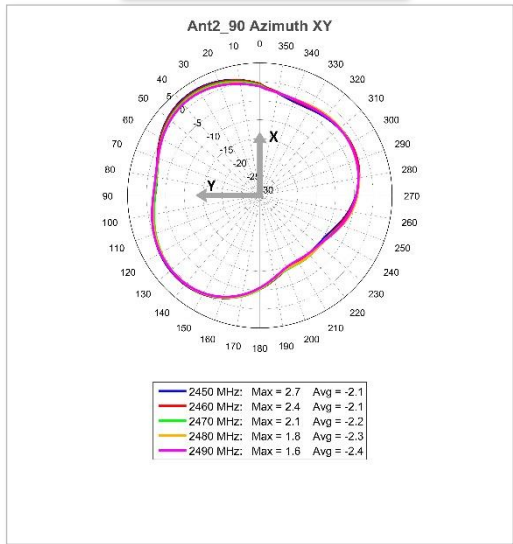
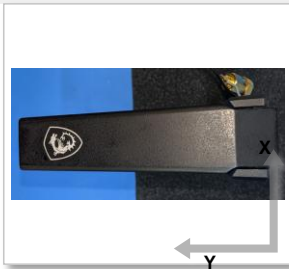


Side to Side Elevation

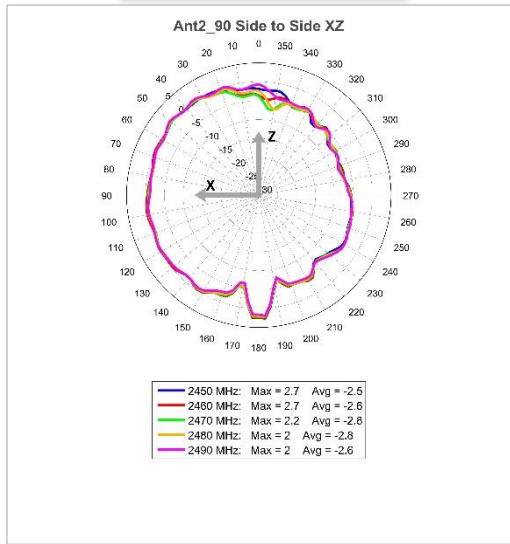


Front to Back Elevation

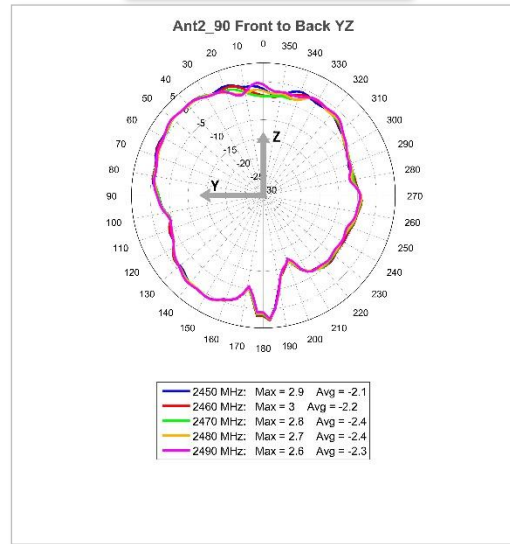
# Wi-Fi 2.4GHz Radiation Pattern for Ant2



Azimuth

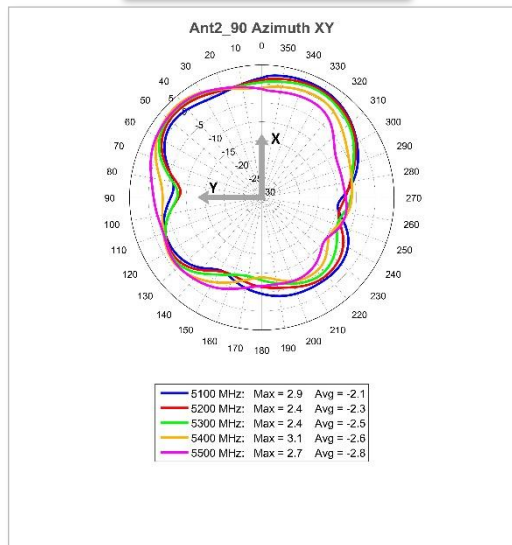


Side to Side Elevation

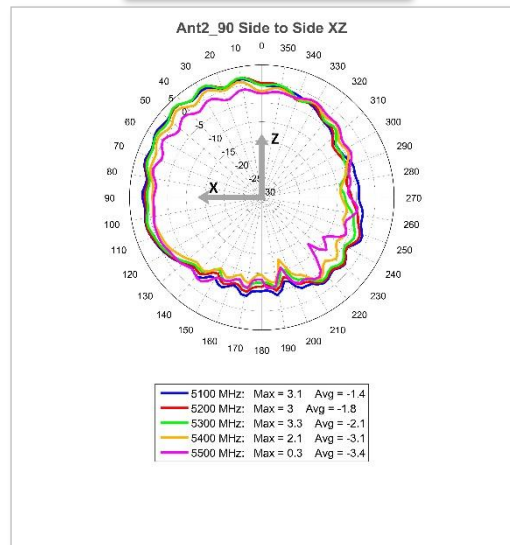


Front to Back Elevation

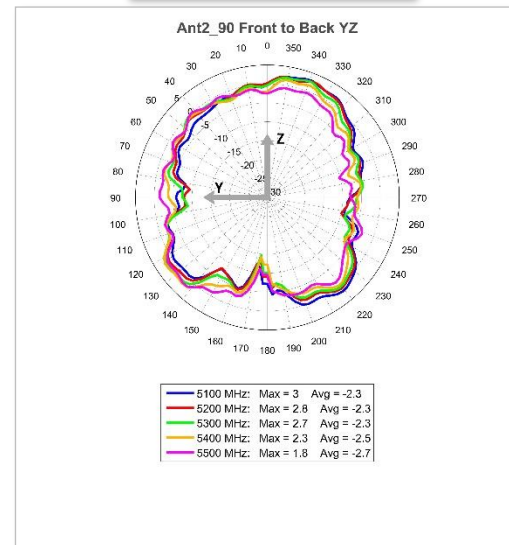
# Wi-Fi 5GHz Radiation Pattern for Ant2



Azimuth

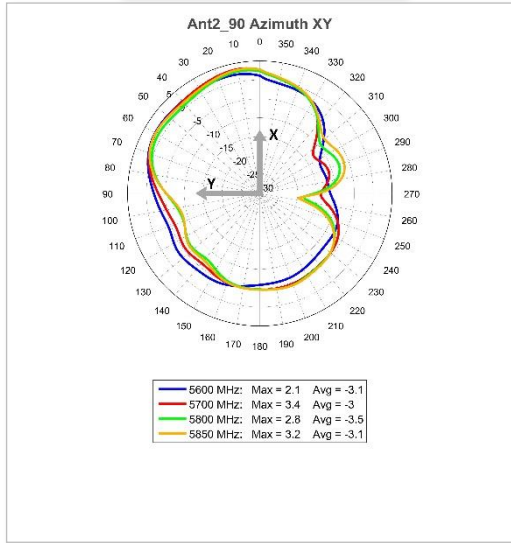
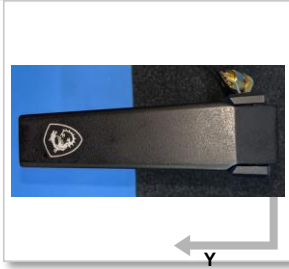


Side to Side Elevation

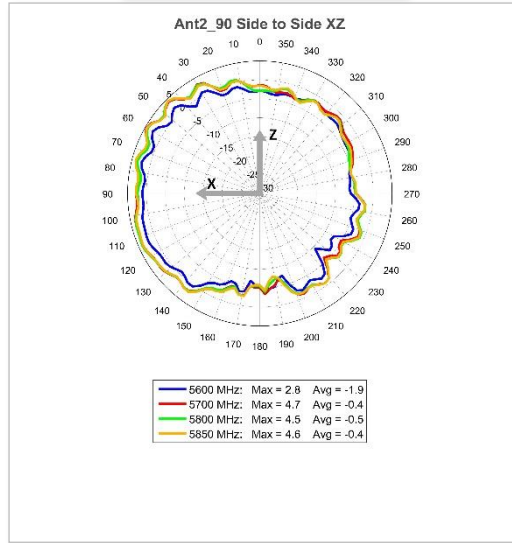


Front to Back Elevation

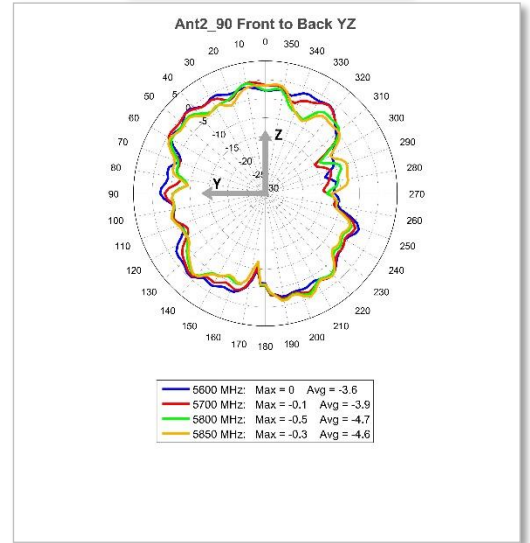
# Wi-Fi 5GHz Radiation Pattern for Ant2



Azimuth

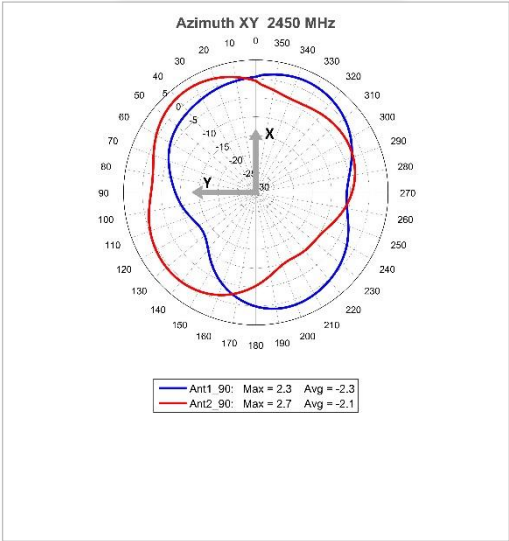
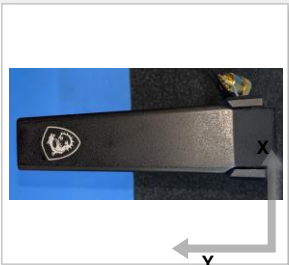


Side to Side Elevation

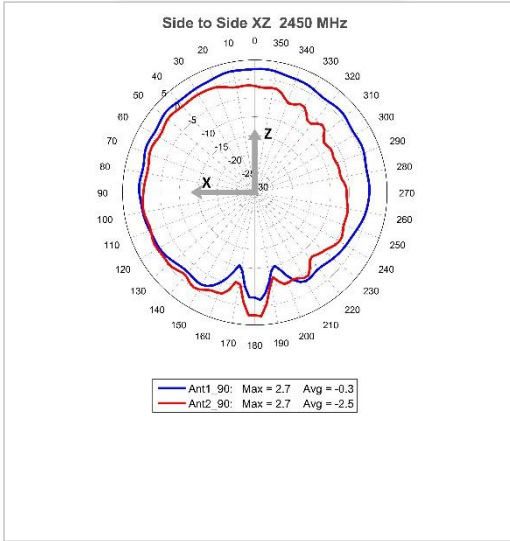


Front to Back Elevation

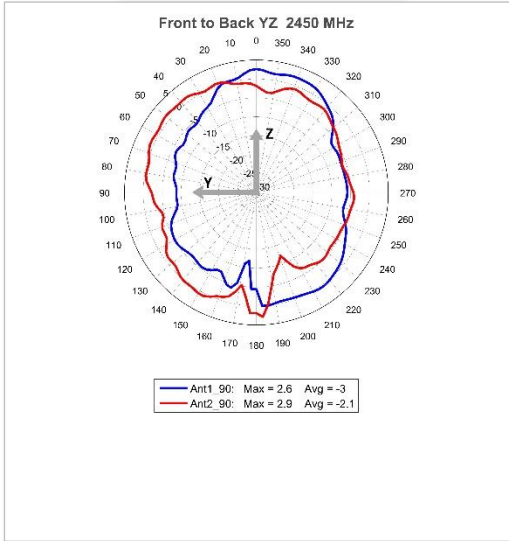
# System Coverage: Wi-Fi 2.44 GHz



Azimuth



Side to Side Elevation

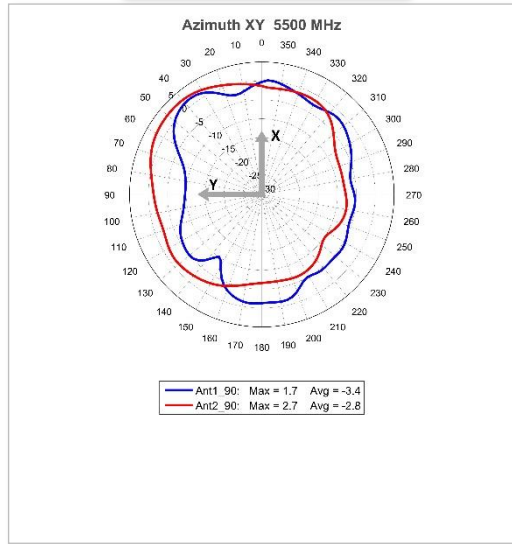
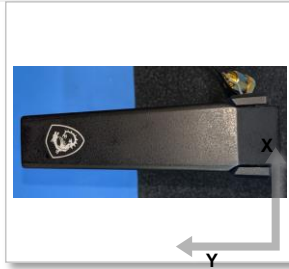


Front to Back Elevation

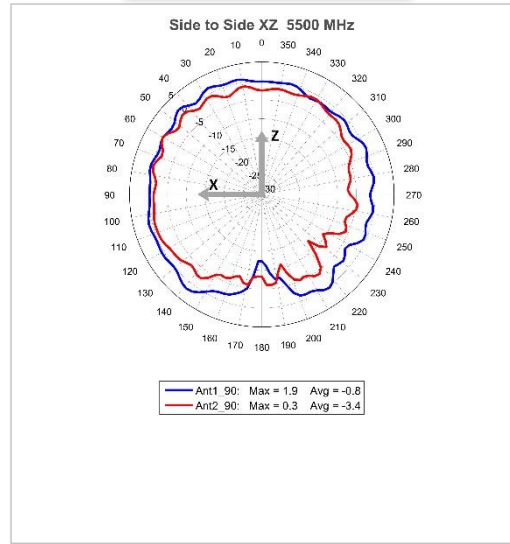




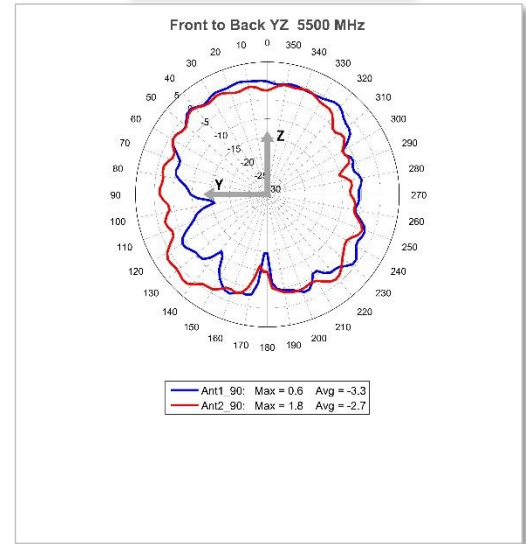
# System Coverage: Wi-Fi 5.5 GHz



Azimuth

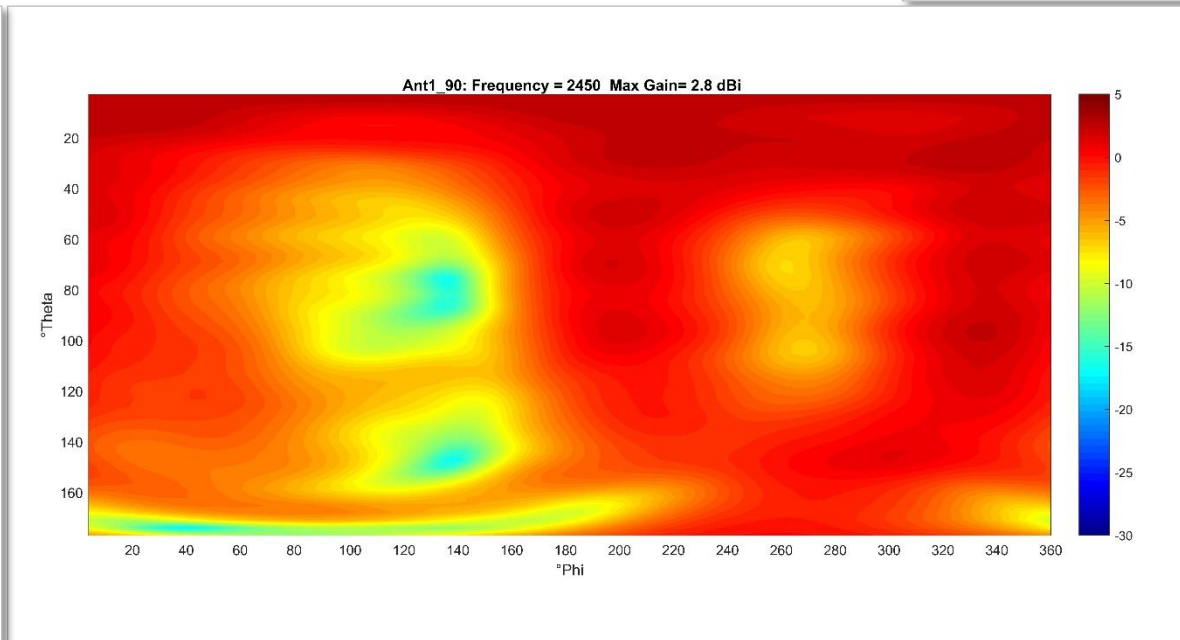
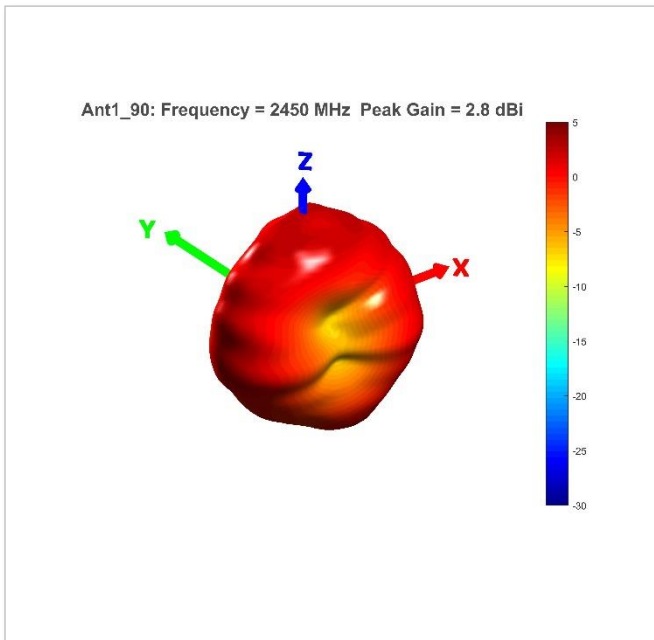


Side to Side Elevation

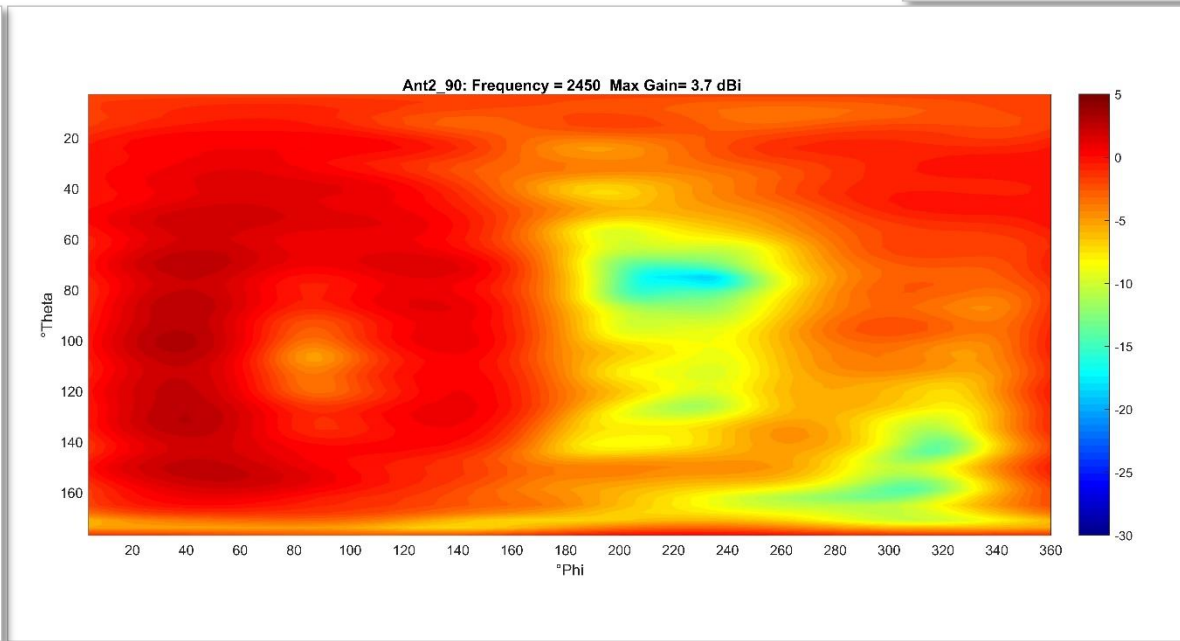
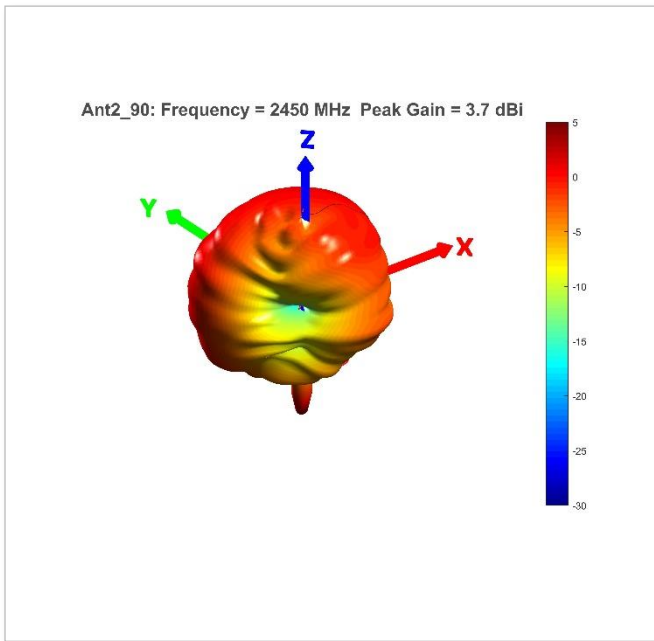


Front to Back Elevation

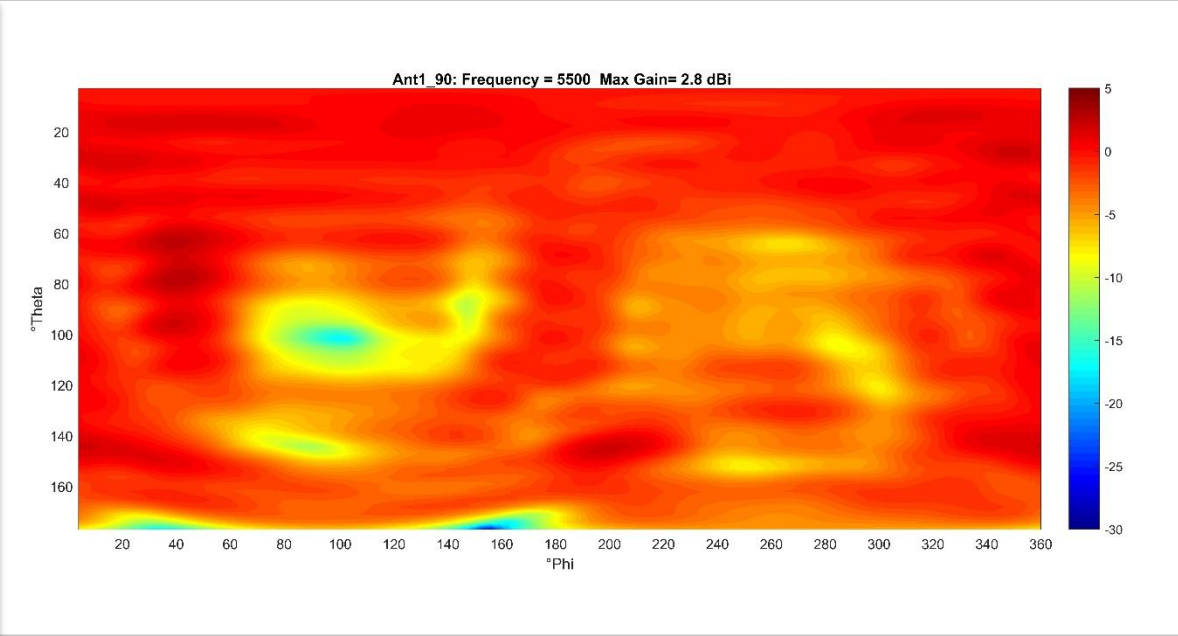
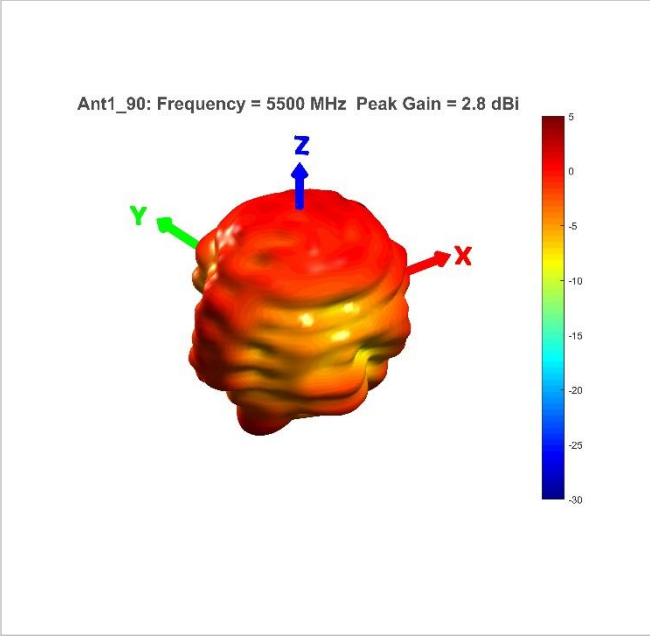
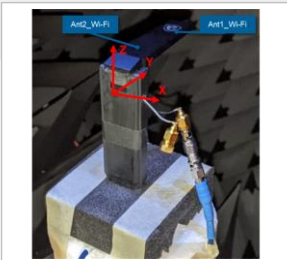
# 3D Pattern – Ant 1 at 2.45 GHz



# 3D Pattern – Ant 2 at 2.45 GHz



# 3D Pattern – Ant 1 at 5.5 GHz



# 3D Pattern – Ant 2 at 5.5 GHz

