



**Product Name:** 3-in-1 Combination Antenna

**Part Number:** MT-4B-AS-3W01

**Features:**

- 2\*WiFi, 1\*BT Antenna Combination
- Support WiFi Dual Bands, 2400-2500MHz, 5150-5850MHz
- Support BT Dual Bands, 2400-2500MHz, 5150-5850MHz
- Customizable Cables and Connectors
- RoHS & REACH Compliant

**Applications:**

- Fleet Management & Telematics
- Vehicle Navigation

# 3-in-1 Combination Antenna

## MODEL: MT-4B-AS-3W01

Preliminary

### I. Specifications:

Items			WiFi M Specifications						
Frequencies (MHz)			2400	2450	2500	5150	5350	5750	5850
Efficiency (%)	Free Space	30cm	77.62	79.62	81.28	61.66	57.54	59.57	51.05
		1m	60.95	62.52	63.83	42.56	39.72	40.46	34.67
		2m	43.15	44.26	45.19	25.06	23.39	23.28	19.95
		3m	30.55	31.33	31.99	14.76	13.77	13.40	11.48
		5m	15.31	15.70	16.03	5.12	4.78	4.44	3.80
	With Ground Plane	30cm	71.45	65.01	58.61	50.47	58.34	56.36	45.29
		1m	56.10	51.05	46.03	34.83	40.27	38.28	30.76
		2m	39.72	36.14	32.58	20.51	23.71	22.03	17.70
		3m	28.12	25.59	23.07	12.08	13.96	12.68	10.19
		5m	14.09	12.82	11.56	4.19	4.84	4.20	3.37
Average Gain (dBi)	Free Space	30cm	-1.10	-0.99	-0.90	-2.10	-2.40	-2.25	-2.92
		1m	-2.15	-2.04	-1.95	-3.71	-4.01	-3.93	-4.60
		2m	-3.65	-3.54	-3.45	-6.01	-6.31	-6.33	-7.00
		3m	-5.15	-5.04	-4.95	-8.31	-8.61	-8.73	-9.40
		5m	-8.15	-8.04	-7.95	-12.91	-13.21	-13.53	-14.20
	With Ground Plane	30cm	-1.46	-1.87	-2.32	-2.97	-2.34	-2.49	-3.44
		1m	-2.51	-2.92	-3.37	-4.58	-3.95	-4.17	-5.12
		2m	-4.01	-4.42	-4.87	-6.88	-6.25	-6.57	-7.52
		3m	-5.51	-5.92	-6.37	-9.18	-8.55	-8.97	-9.92
		5m	-8.51	-8.92	-9.37	-13.78	-13.15	-13.77	-14.72

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<b>Peak Gain (dBi)</b>	<b>Free Space</b>	<b>30cm</b>	4.80	4.47	5.06	3.27	3.39	4.05	3.82
		<b>1m</b>	3.75	3.42	4.01	1.66	1.78	2.37	2.14
		<b>2m</b>	2.25	1.92	2.51	-0.64	-0.52	-0.03	-0.26
		<b>3m</b>	0.75	0.42	1.01	-2.94	-2.82	-2.43	-2.66
		<b>5m</b>	-2.25	-2.58	-1.99	-7.54	-7.42	-7.23	-7.46
	<b>With Ground Plane</b>	<b>30cm</b>	4.32	4.80	4.54	2.68	4.94	6.05	5.83
		<b>1m</b>	3.27	3.75	3.49	1.07	3.33	4.37	4.15
		<b>2m</b>	1.77	2.25	1.99	-1.23	1.03	1.97	1.75
		<b>3m</b>	0.27	0.75	0.49	-3.53	-1.27	-0.43	-0.65
		<b>5m</b>	-2.73	-2.25	-2.51	-8.13	-5.87	-5.23	-5.45
<b>V.S.W.R</b>			< 2						
<b>Return Loss (dB)</b>			< -10						
<b>Impedance (<math>\Omega</math>)</b>			50						
<b>Polarization</b>			Linear						
<b>Cable / Length</b>			H-100 / 2 Meters						
<b>Connector</b>			SMA (Male)						

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Items		WiFi A Specifications							
Frequencies (MHz)		2400	2450	2500	5150	5350	5750	5850	
<b>Efficiency (%)</b>	<b>Free Space</b>	<b>30cm</b>	75.51	78.89	86.70	72.28	75.34	66.99	58.34
		<b>1m</b>	59.29	61.94	68.08	49.89	52.00	45.50	39.63
		<b>2m</b>	41.98	43.85	48.19	29.38	30.62	26.18	22.80
		<b>3m</b>	29.72	31.05	34.12	17.30	18.03	15.07	13.12
		<b>5m</b>	14.89	15.56	17.10	6.00	6.25	4.99	4.35
	<b>With Ground Plane</b>	<b>30cm</b>	50.82	47.75	60.53	59.57	57.02	59.57	51.88
		<b>1m</b>	39.90	37.50	47.53	41.11	39.36	37.50	35.24
		<b>2m</b>	28.25	26.55	33.65	24.21	23.17	23.28	20.28
		<b>3m</b>	20.00	18.79	23.82	14.26	13.65	13.40	11.67
		<b>5m</b>	10.02	9.42	11.94	4.94	4.73	4.44	3.86

<b>Average Gain (dBi)</b>	<b>Free Space</b>	<b>30cm</b>	-1.22	-1.03	-0.62	-1.41	-1.23	-1.74	-2.34
		<b>1m</b>	-2.27	-2.08	-1.67	-3.02	-2.84	-3.42	-4.02
		<b>2m</b>	-3.77	-3.58	-3.17	-5.32	-5.14	-5.82	-6.42
		<b>3m</b>	-5.27	-5.08	-4.67	-7.62	-7.44	-8.22	-8.82
		<b>5m</b>	-8.27	-8.08	-7.67	-12.22	-12.04	-13.02	-13.62
	<b>With Ground Plane</b>	<b>30cm</b>	-2.94	-3.21	-2.18	-2.25	-2.44	-2.25	-2.85
		<b>1m</b>	-3.99	-4.26	-3.23	-3.86	-4.05	-4.26	-4.53
		<b>2m</b>	-5.49	-5.76	-4.73	-6.16	-6.35	-6.33	-6.93
		<b>3m</b>	-6.99	-7.26	-6.23	-8.46	-8.65	-8.73	-9.33
		<b>5m</b>	-9.99	-10.26	-9.23	-13.06	-13.25	-13.53	-14.13
<b>Peak Gain (dBi)</b>	<b>Free Space</b>	<b>30cm</b>	5.49	5.99	5.82	4.09	6.40	3.06	2.96
		<b>1m</b>	4.44	4.94	4.77	2.48	4.79	1.38	1.28
		<b>2m</b>	2.94	3.44	3.27	0.18	2.49	-1.02	-1.12
		<b>3m</b>	1.44	1.94	1.77	-2.12	0.19	-3.42	-3.52
		<b>5m</b>	-1.56	-1.06	-1.23	-6.72	-4.41	-8.22	-8.32
	<b>With Ground Plane</b>	<b>30cm</b>	3.46	3.77	4.12	4.40	3.95	4.60	4.24
		<b>1m</b>	2.41	2.72	3.07	2.79	2.34	2.92	2.56
		<b>2m</b>	0.91	1.22	1.57	0.49	0.04	0.52	0.16
		<b>3m</b>	-0.59	-0.28	0.07	-1.81	-2.26	-1.88	-2.24
		<b>5m</b>	-3.59	-3.28	-2.93	-6.41	-6.86	-6.68	-7.04
<b>V.S.W.R</b>			< 2						
<b>Return Loss (dB)</b>			< -10						
<b>Impedance (<math>\Omega</math>)</b>			50						
<b>Polarization</b>			Linear						
<b>Cable / Length</b>			H-100 / 2 Meters						
<b>Connector</b>			SMA (Male)						

Items			BT Specifications						
Frequencies (MHz)			2400	2450	2500	5150	5350	5750	5850
Efficiency (%)	Free Space	30cm	55.46	57.15	61.52	79.43	61.94	72.78	66.22
		1m	43.55	44.87	48.31	54.83	44.46	49.43	44.98
		2m	30.83	31.77	34.20	32.28	26.18	28.44	25.88
		3m	21.83	22.49	24.21	19.01	15.42	16.37	14.89
		5m	10.94	11.27	12.13	6.59	5.35	5.42	4.93
	With Ground Plane	30cm	41.78	36.81	38.55	80.17	70.47	78.52	69.18
		1m	32.81	28.91	30.27	55.34	48.64	28.91	46.99
		2m	23.23	20.46	21.43	32.58	28.64	30.69	27.04
		3m	16.44	14.49	15.17	19.19	16.87	17.66	15.56
		5m	8.24	7.26	7.60	6.65	5.85	5.85	5.15
Average Gain (dBi)	Free Space	30cm	-2.56	-2.43	-2.11	-1.00	-2.08	-1.38	-1.79
		1m	-3.61	-3.48	-3.16	-2.61	-3.52	-3.06	-3.47
		2m	-5.11	-4.98	-4.66	-4.91	-5.82	-5.46	-5.87
		3m	-6.61	-6.48	-6.16	-7.21	-8.12	-7.86	-8.27
		5m	-9.61	-9.48	-9.16	-11.81	-12.72	-12.66	-13.07
	With Ground Plane	30cm	-3.79	-4.34	-4.14	-0.96	-1.52	-1.05	-1.60
		1m	-4.84	-5.39	-5.19	-2.57	-3.13	-5.39	-3.28
		2m	-6.34	-6.89	-6.69	-4.87	-5.43	-5.13	-5.68
		3m	-7.84	-8.39	-8.19	-7.17	-7.73	-7.53	-8.08
		5m	-10.84	-11.39	-11.19	-11.77	-12.33	-12.33	-12.88
Peak Gain (dBi)	Free Space	30cm	3.22	3.42	4.97	7.04	5.16	6.98	6.06
		1m	2.17	2.37	3.92	5.43	3.55	5.30	4.38
		2m	0.67	0.87	2.42	3.13	1.25	2.90	1.98
		3m	-0.83	-0.63	0.92	0.83	-1.05	0.50	-0.42
		5m	-3.83	-3.63	-2.08	-3.77	-5.65	-4.30	-5.22
	With Ground Plane	30cm	4.09	2.54	2.66	7.02	5.00	5.47	5.30
		1m	3.04	1.49	1.61	5.41	3.39	3.79	3.62
		2m	1.54	-0.01	0.11	3.11	1.09	1.39	1.22
		3m	0.04	-1.51	-1.39	0.81	-1.21	-1.01	-1.18
		5m	-2.96	-4.51	-4.39	-3.79	-5.81	-5.81	-5.98

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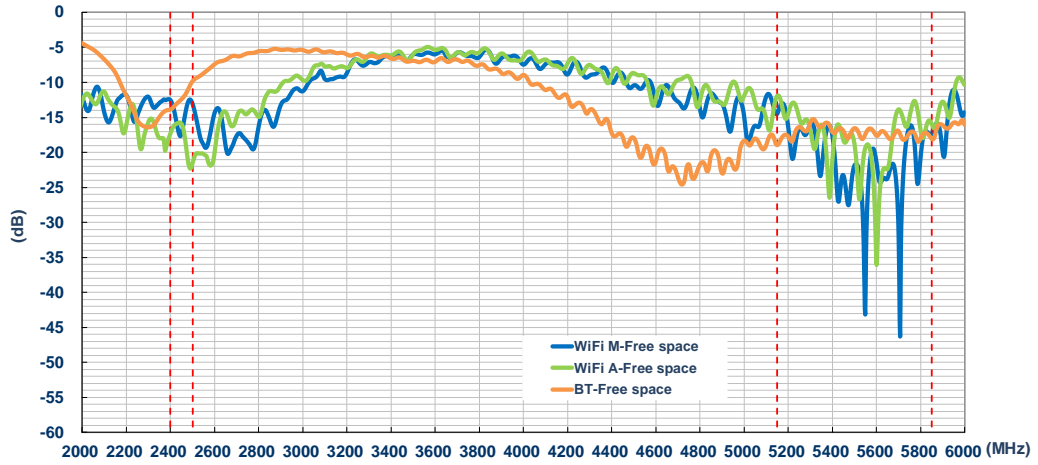
<b>V.S.W.R</b>	< 2
<b>Return Loss (dB)</b>	< -10
<b>Impedance (<math>\Omega</math>)</b>	50
<b>Polarization</b>	Linear
<b>Cable / Length</b>	H-100 / 2 Meters
<b>Connector</b>	SMA (Male)
<b>Mechanical</b>	
<b>Dimension (mm)</b>	$\phi$ 65.00(D) x 20.35(H)
<b>Casing</b>	PC + TPE
<b>Weigh (g)(including cable)</b>	91
<b>Waterproof Resistant</b>	IP67 / IP69K
<b>Maximum Assembly Torque</b>	40 N-m
<b>Environmental Conditions</b>	
<b>Operation Temperature (°C)</b>	-40 ~ +85
<b>Storage Temperature (°C)</b>	-40 ~ +85
<b>Humidity</b>	95% non-condensing

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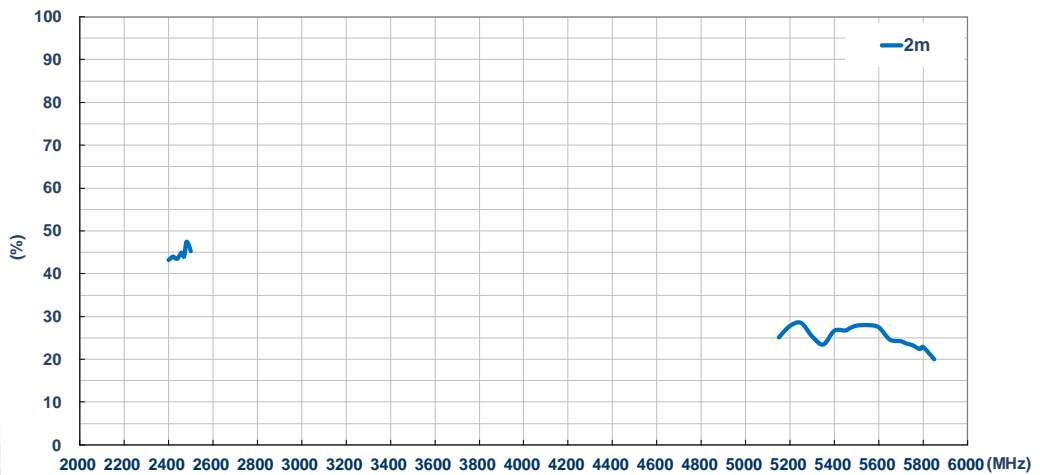
## II. Antenna Technical Parameters:

Free Space

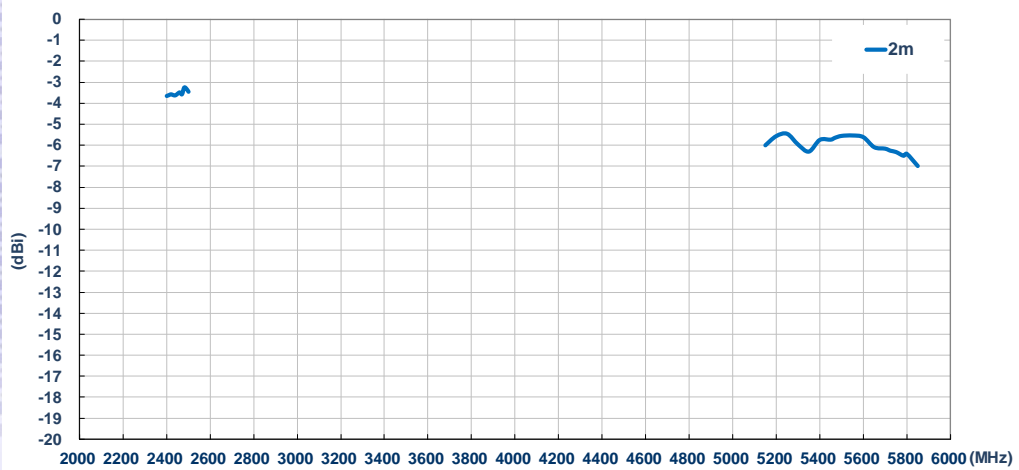
S11 (dB) - WiFi M & WiFi A & BT



Efficiency (%) - WiFi M

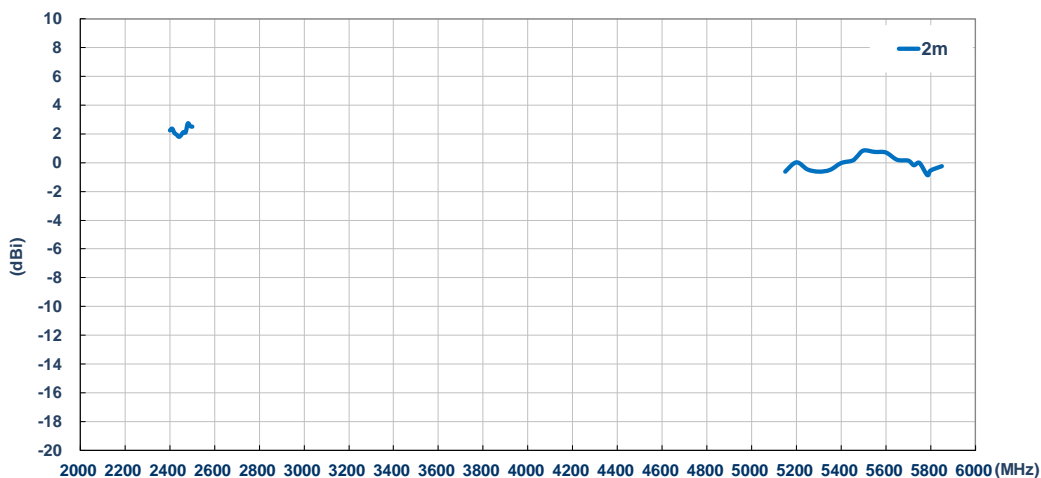


Average Gain (dBi) - WiFi M



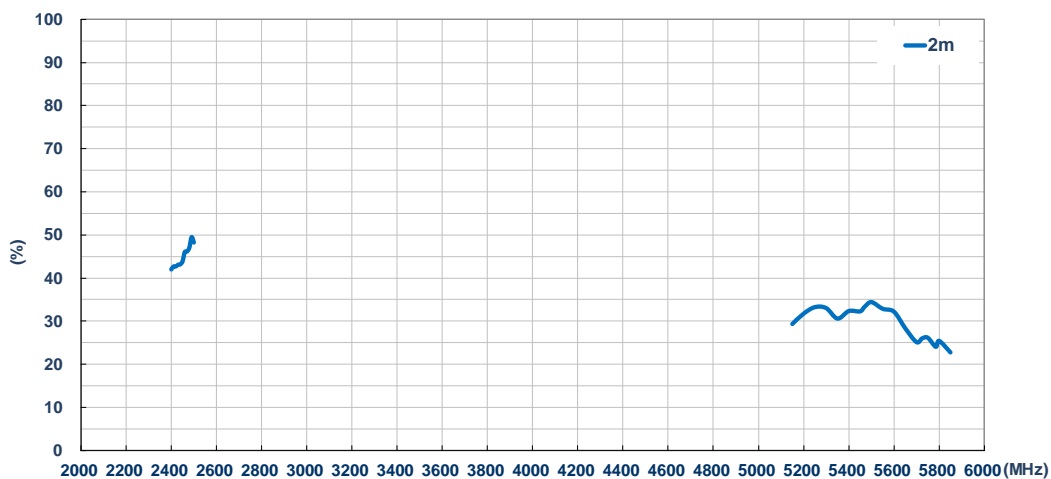
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### Peak Gain (dBi) – WiFi M

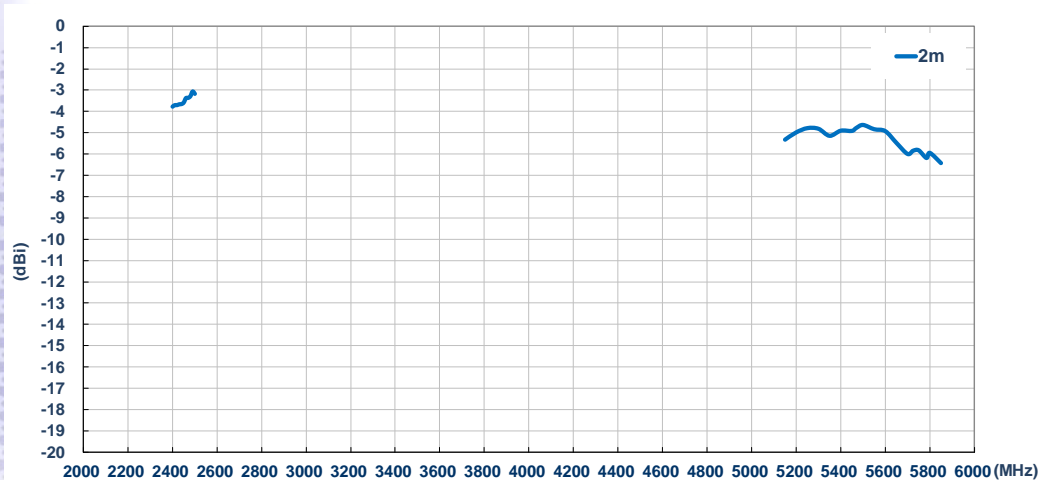


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### Efficiency (%) – WiFi A

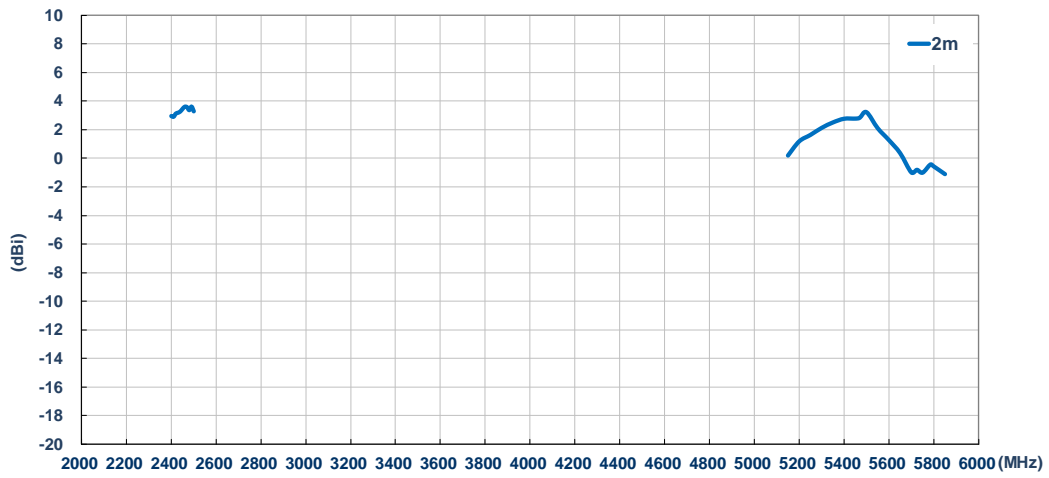


### Average Gain (dBi) – WiFi A



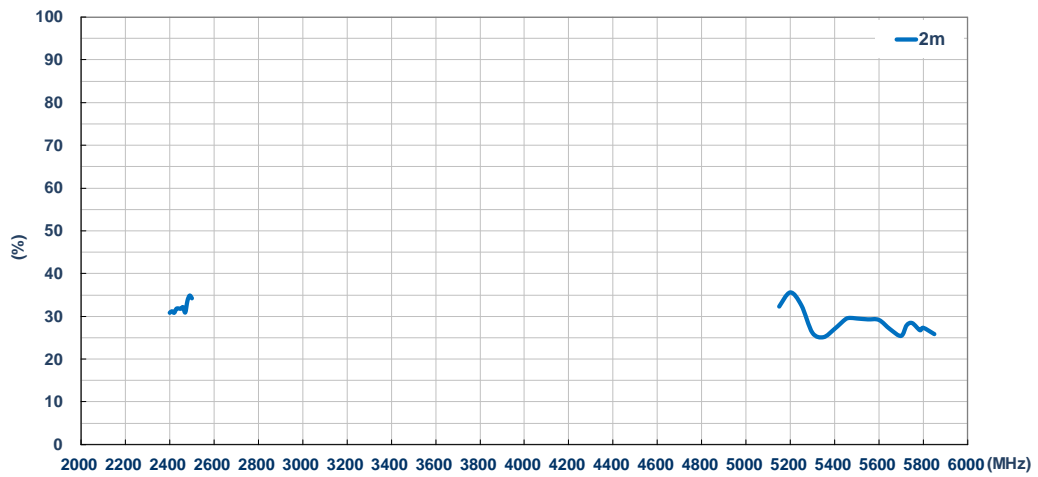


### Peak Gain (dBi) – WiFi A

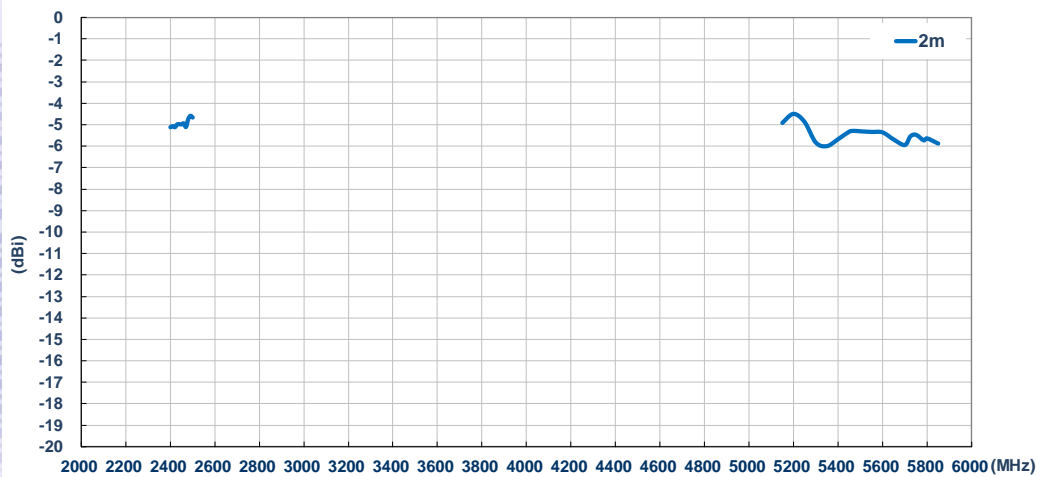


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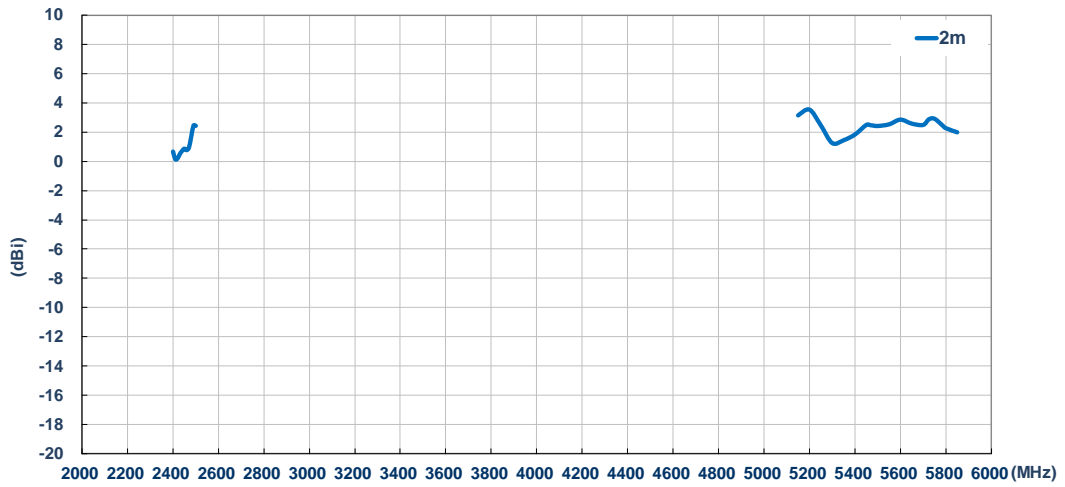
### Efficiency (%) – BT



### Average Gain (dBi) – BT



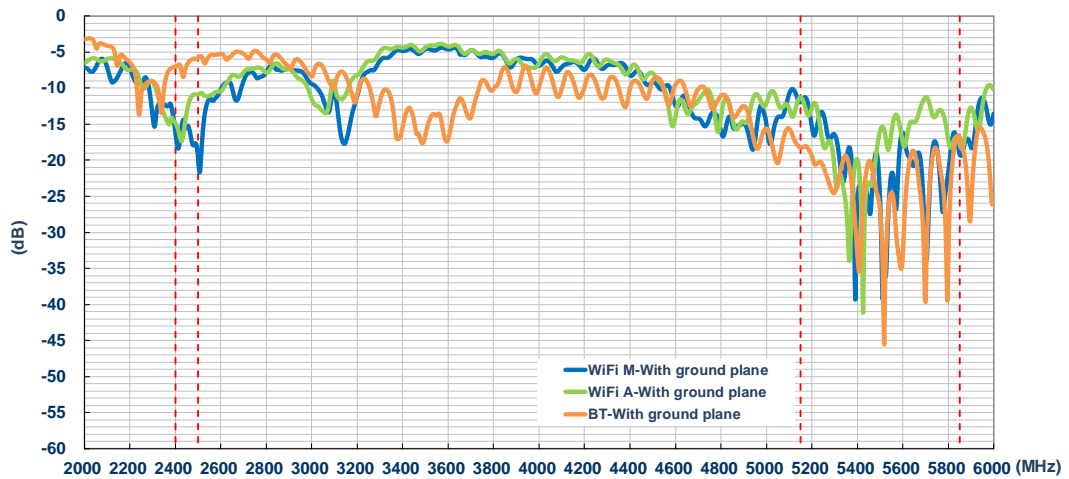
Peak Gain (dBi) – BT



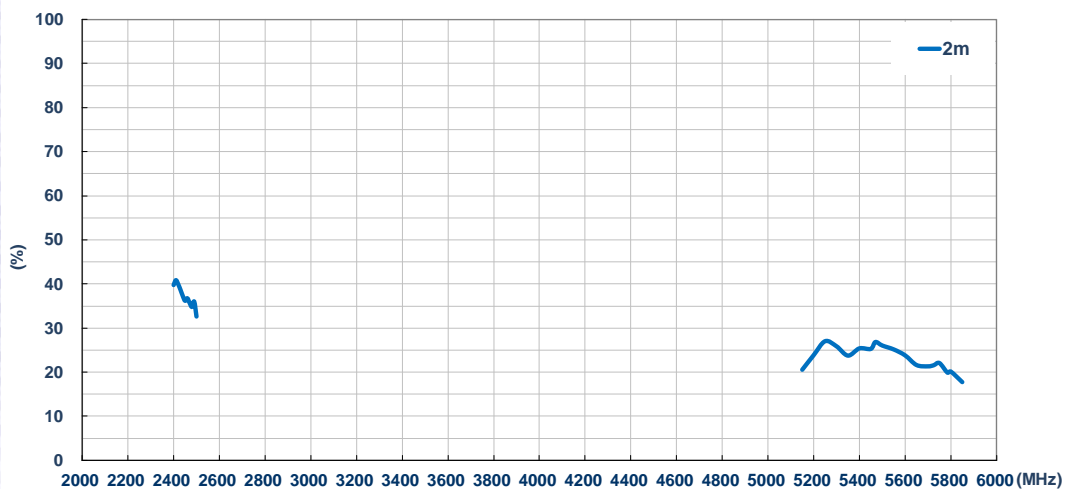
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With Ground Plane

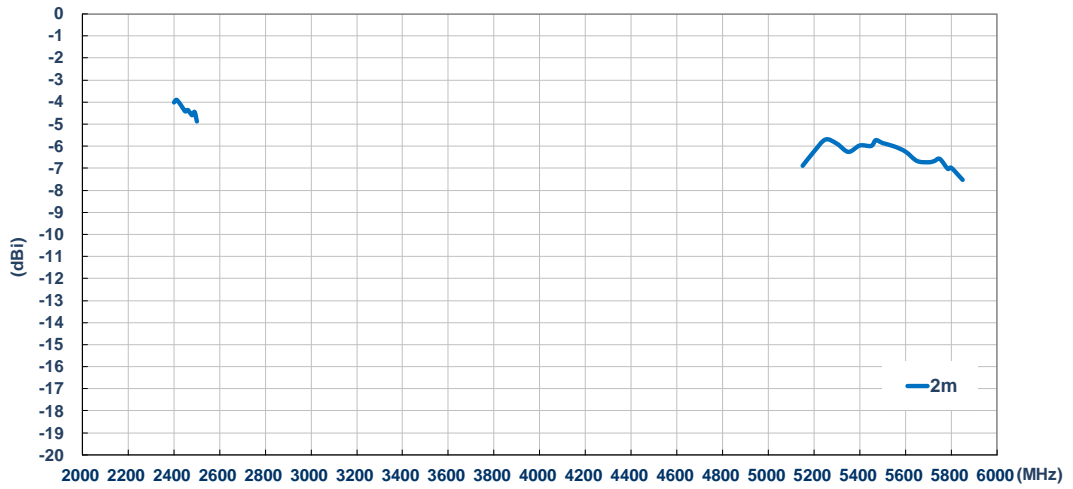
S11 (dB) – WiFi M & WiFi A & BT



Efficiency (%) – WiFi M

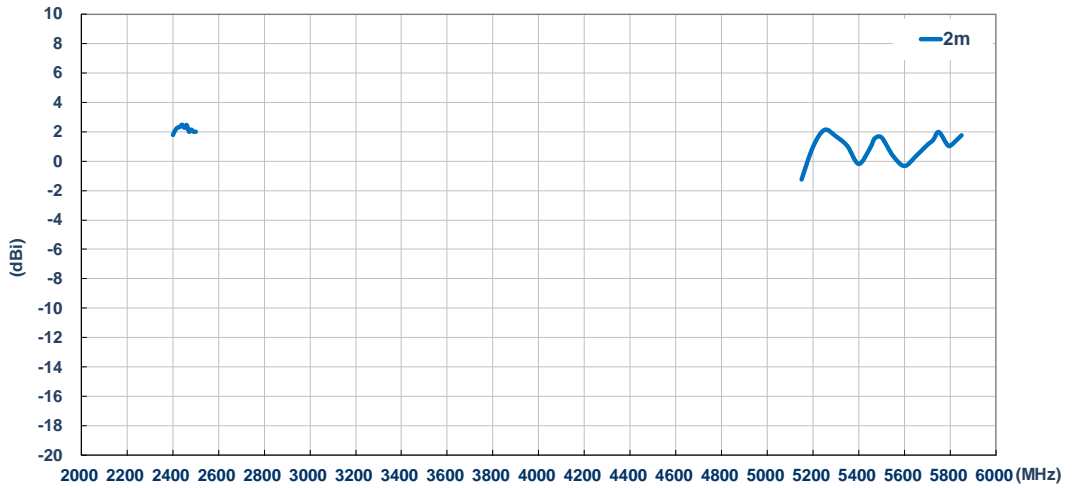


Average Gain (dBi) – WiFi M

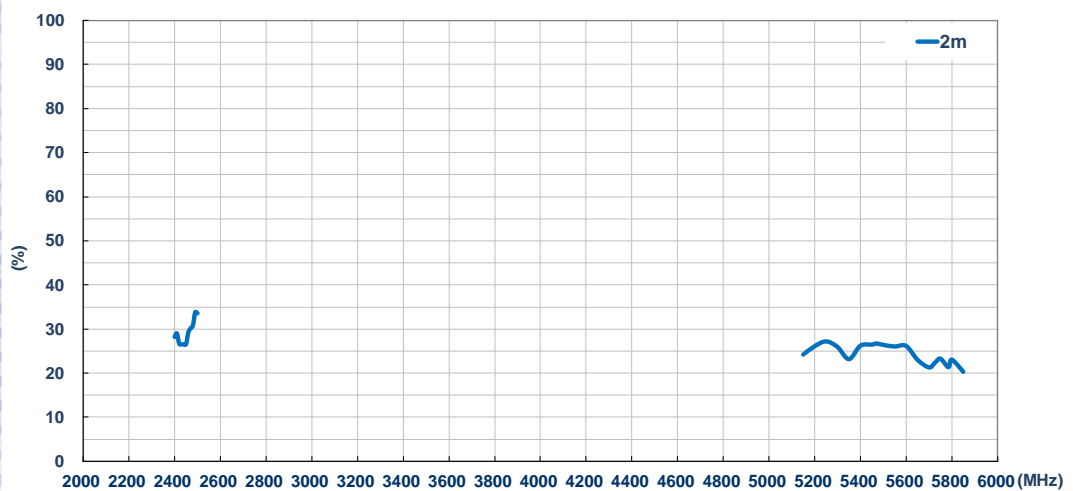


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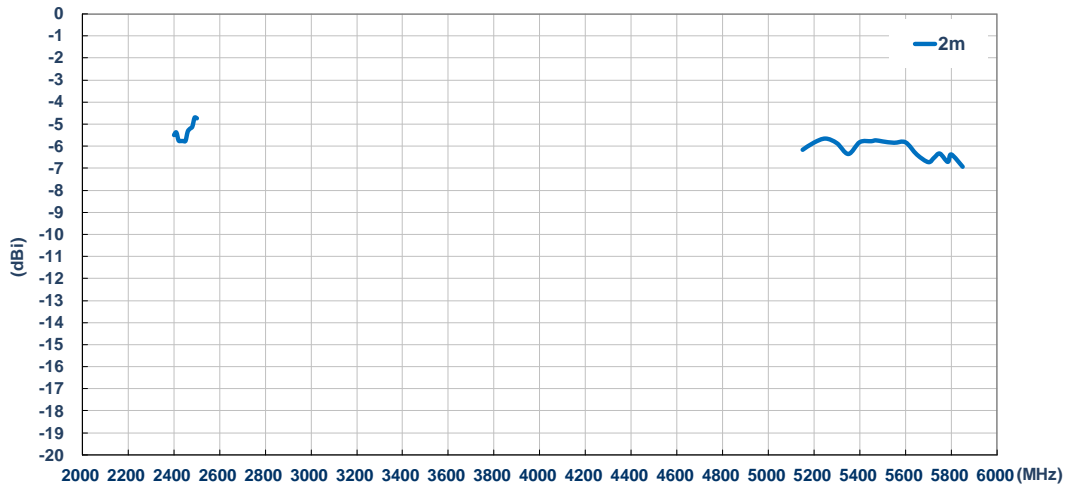
Peak Gain (dBi) – WiFi M



Efficiency (%) – WiFi A

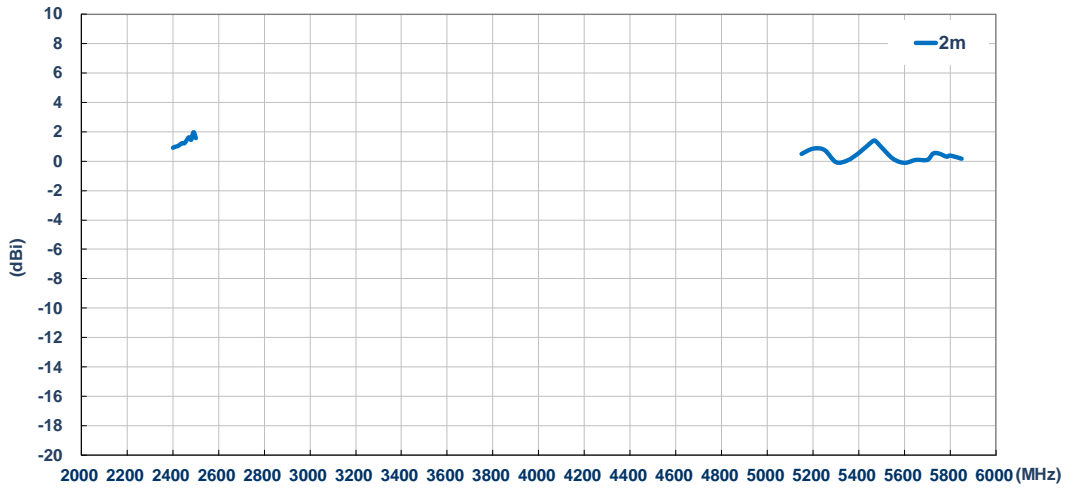


Average Gain (dBi) – WiFi A

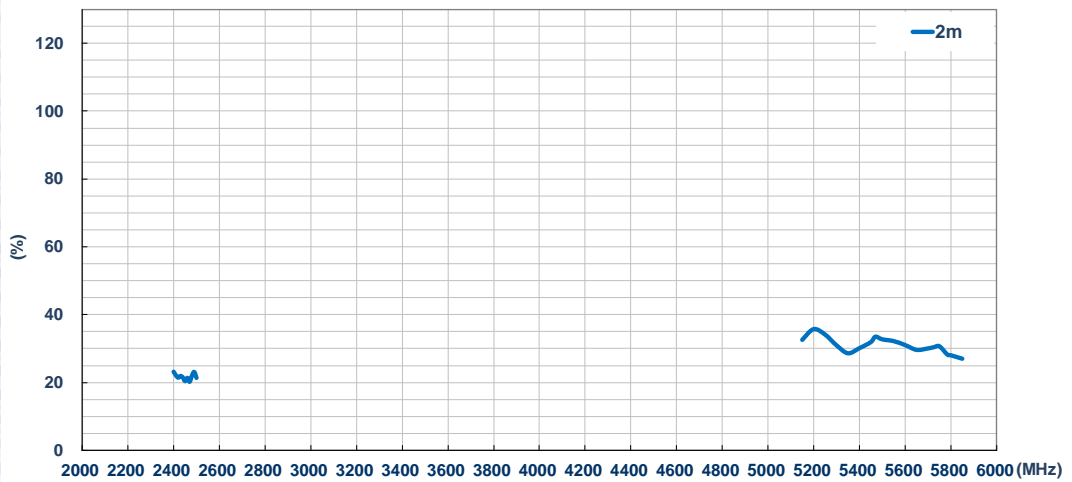


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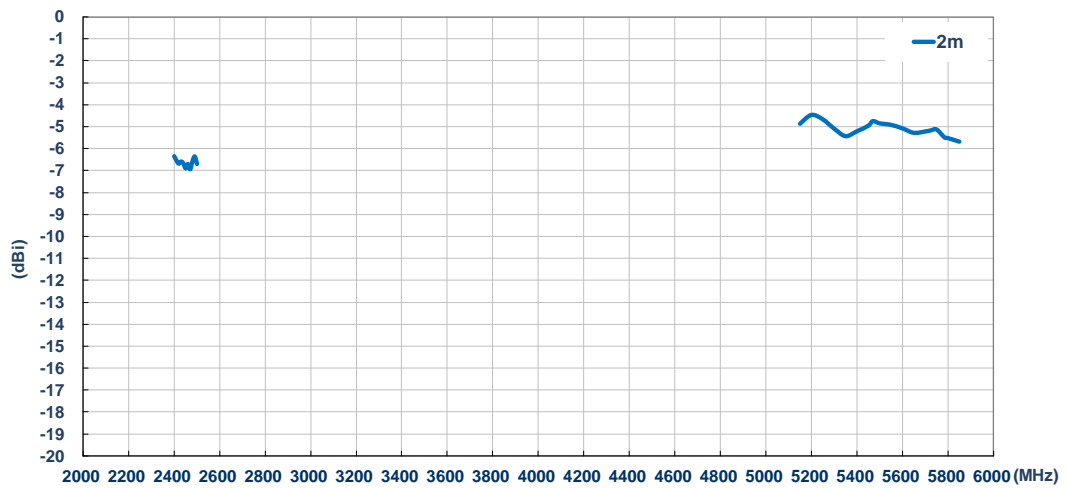
Peak Gain (dBi) – WiFi A



Efficiency (%) – BT

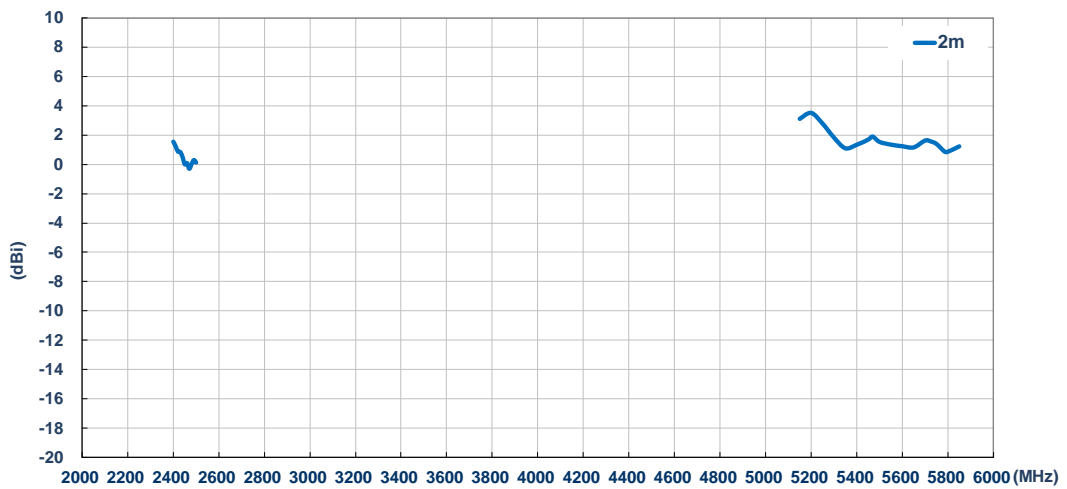


Average Gain (dBi) – BT



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Peak Gain (dBi) – BT

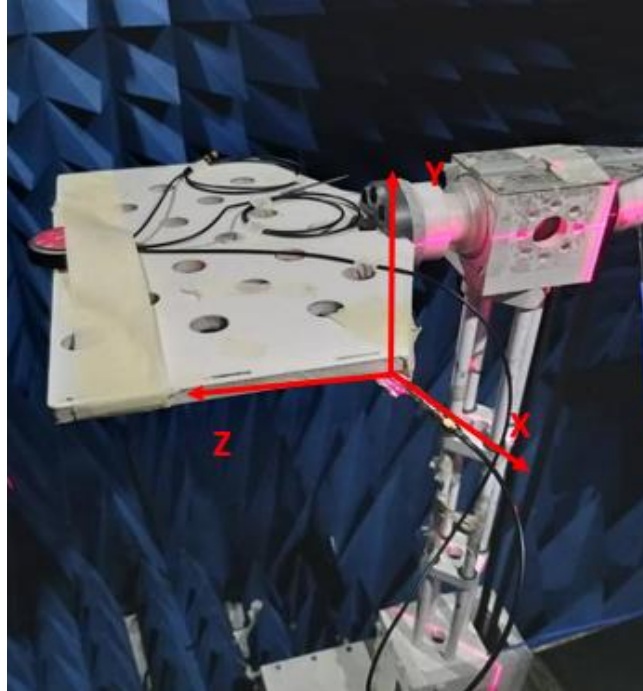


### III. Antenna Radiation Pattern Measurement:

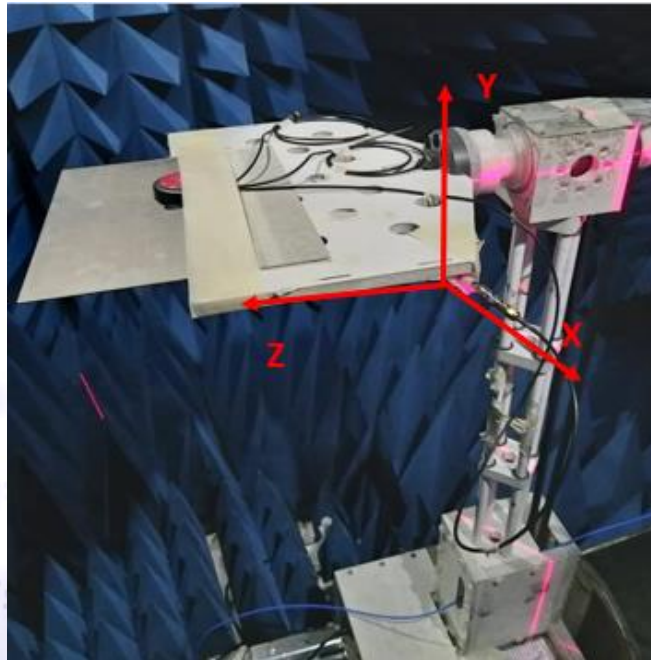
The antenna radiation patterns are measured in 3D Anechoic Chamber.

The measurement setup is as show below,

Free Space



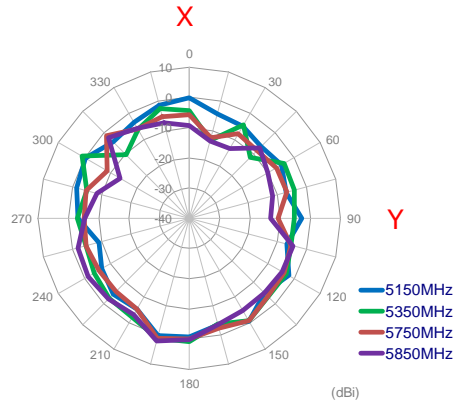
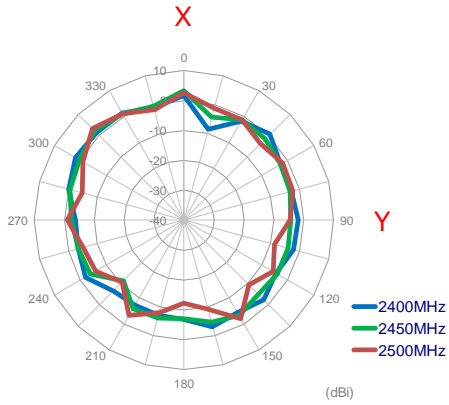
With Ground Plane



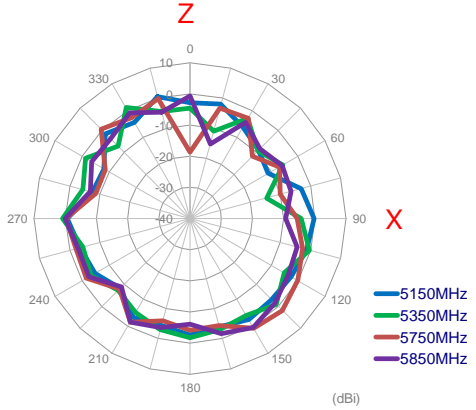
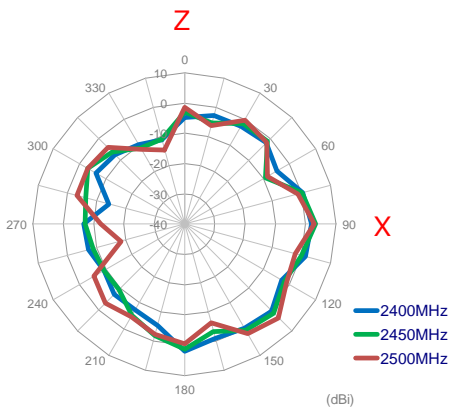
## A) 2D Radiation Pattern:

Free Space – WiFi M

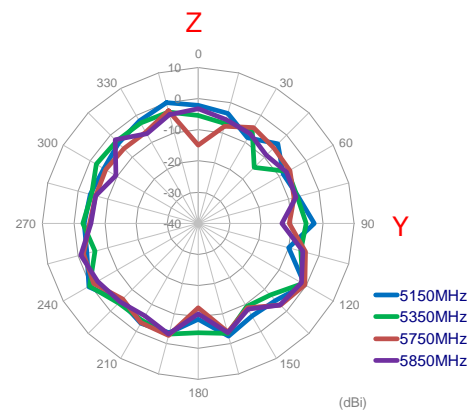
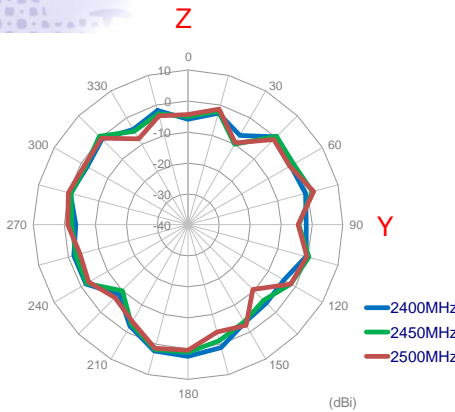
X-Y Plane



X-Z Plane



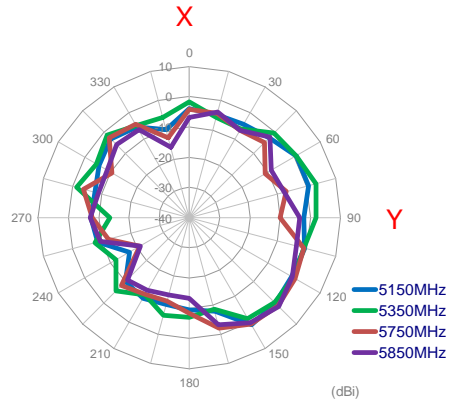
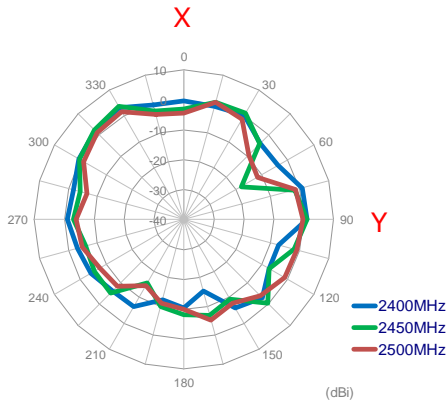
Y-Z Plane



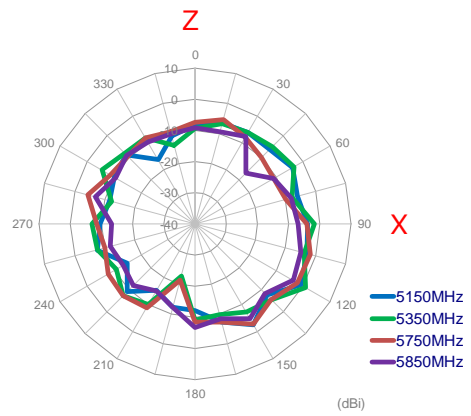
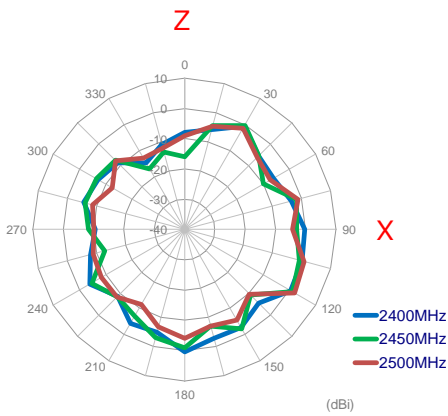
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With Ground Plane – WiFi M

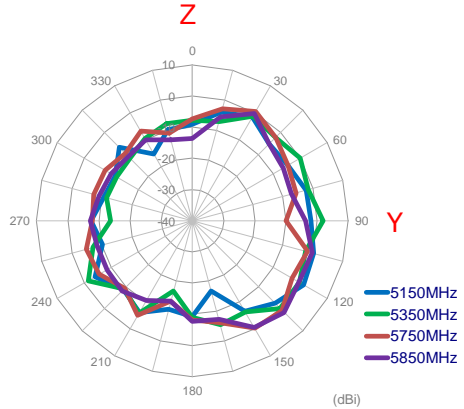
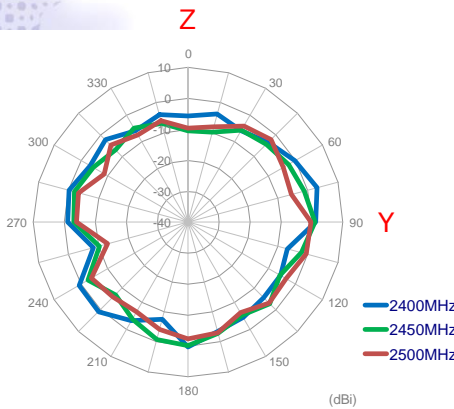
X-Y Plane



X-Z Plane



Y-Z Plane

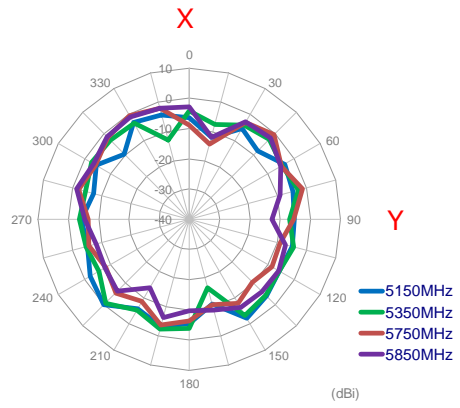
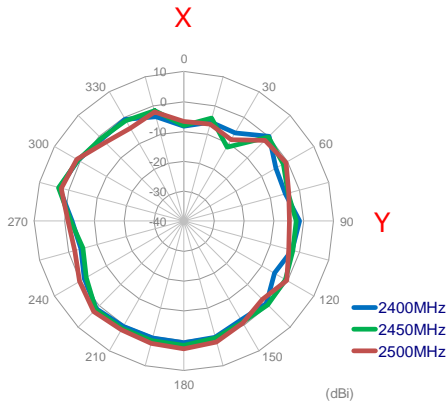


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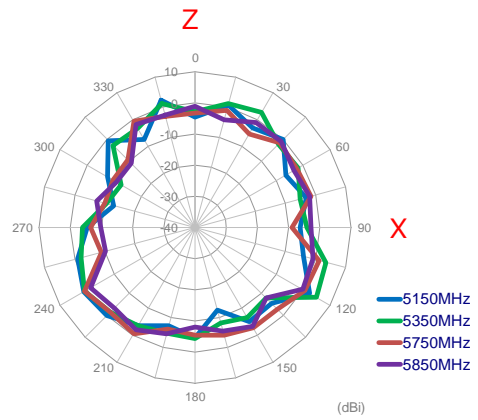
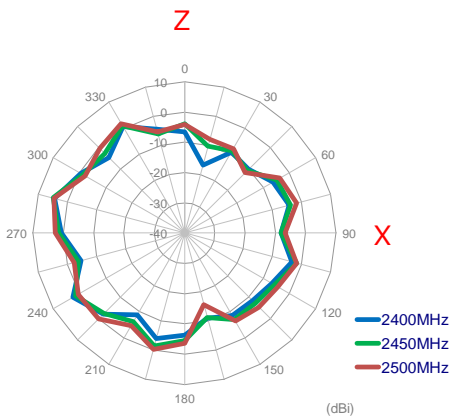


## Free Space – WiFi A

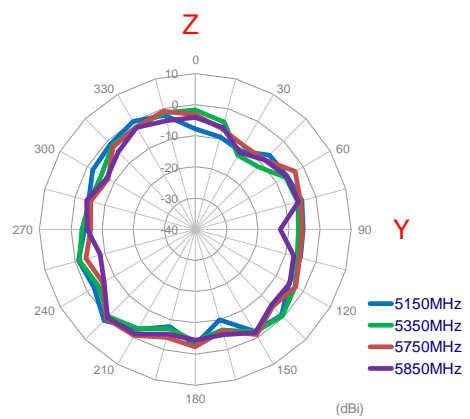
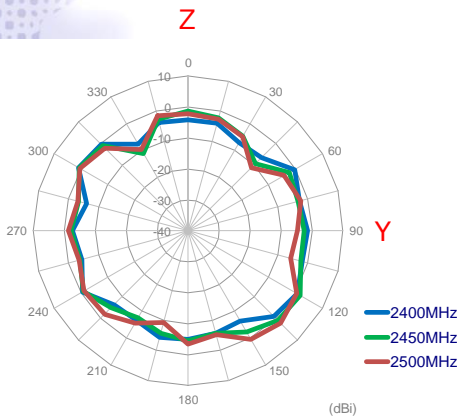
### X-Y Plane



### X-Z Plane



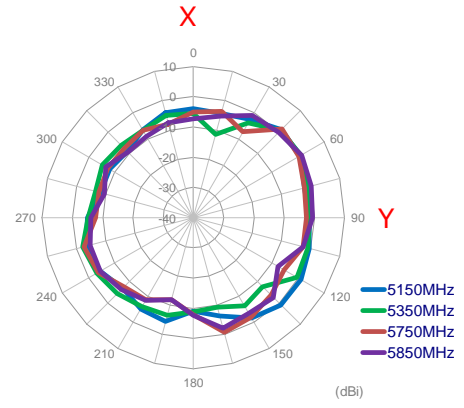
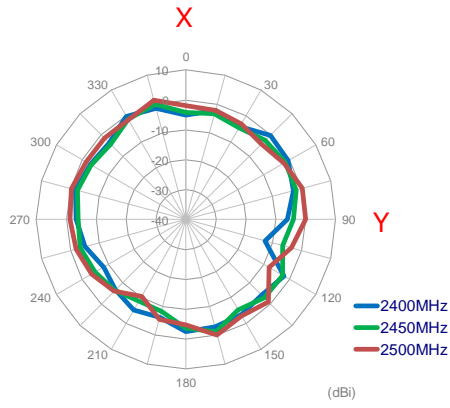
### Y-Z Plane



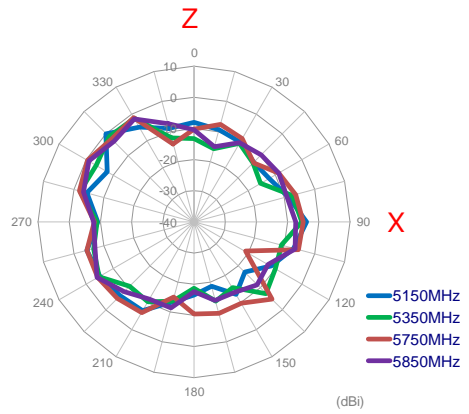
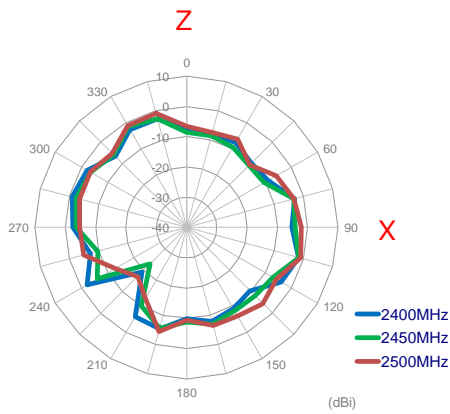
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With Ground Plane – WiFi A

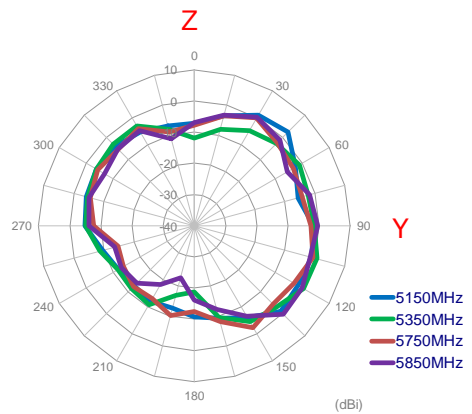
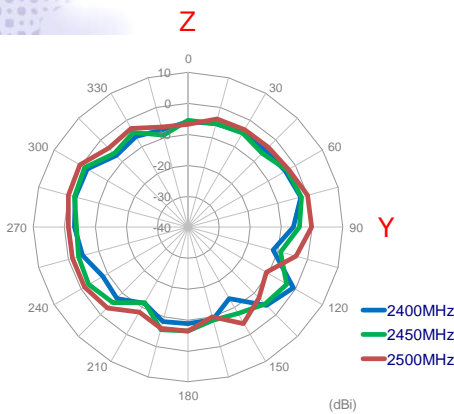
X-Y Plane



X-Z Plane



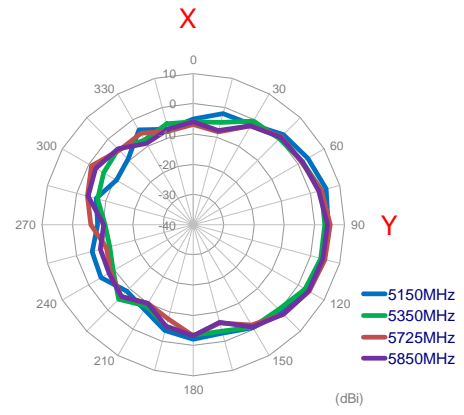
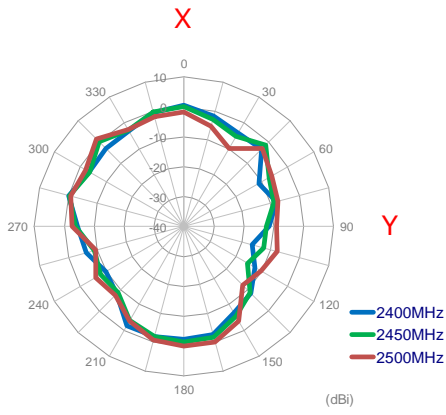
Y-Z Plane



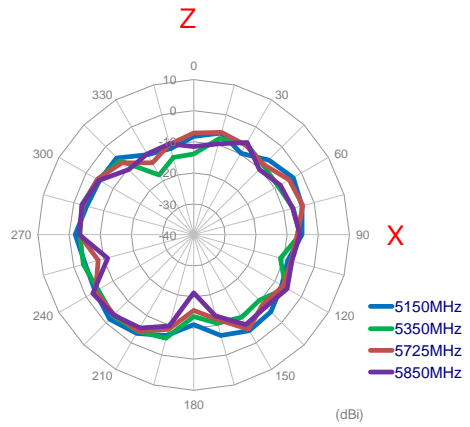
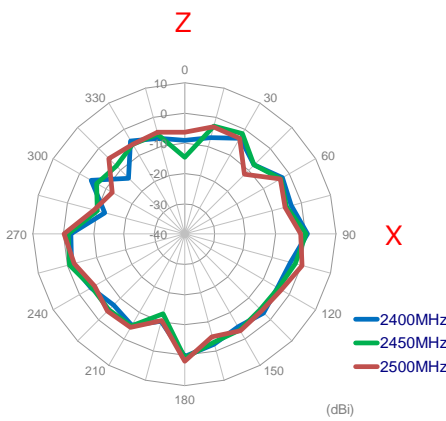
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Free Space - BT

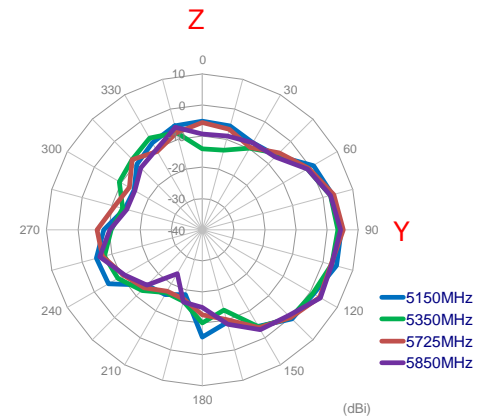
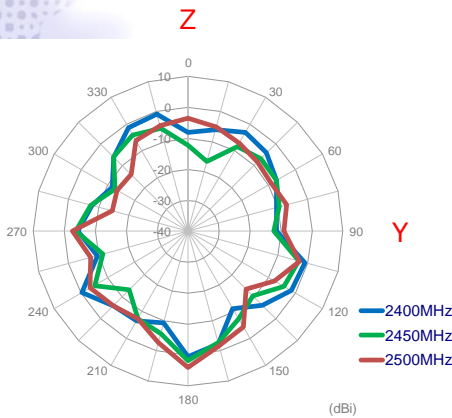
X-Y Plane



X-Z Plane



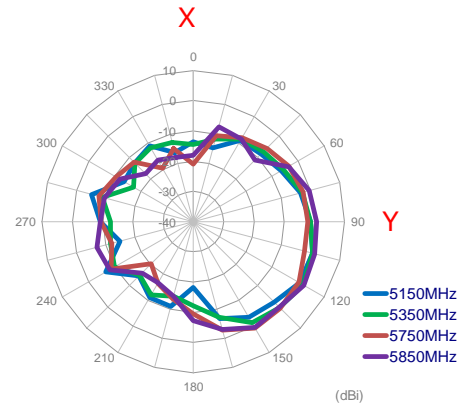
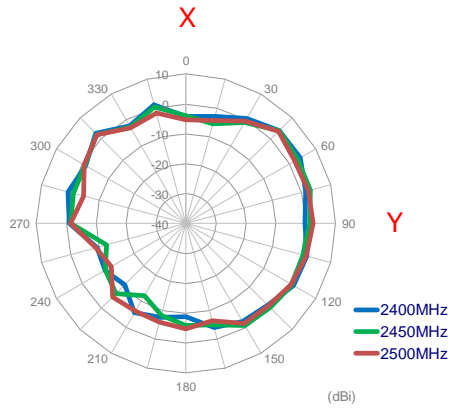
Y-Z Plane



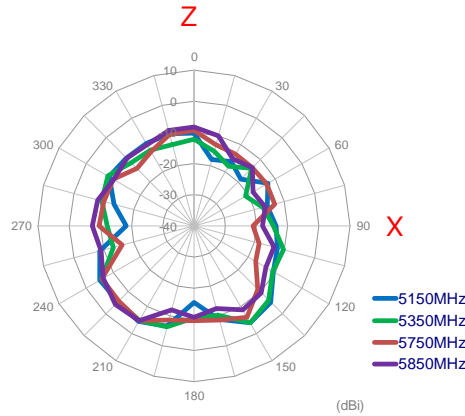
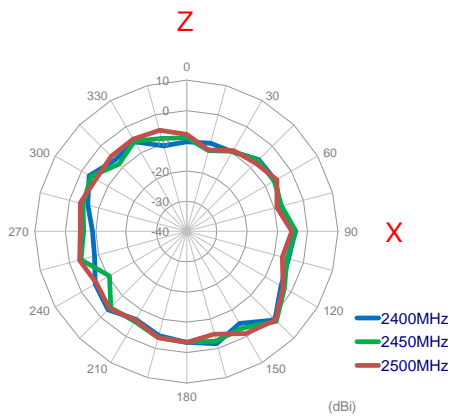
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With Ground Plane – BT

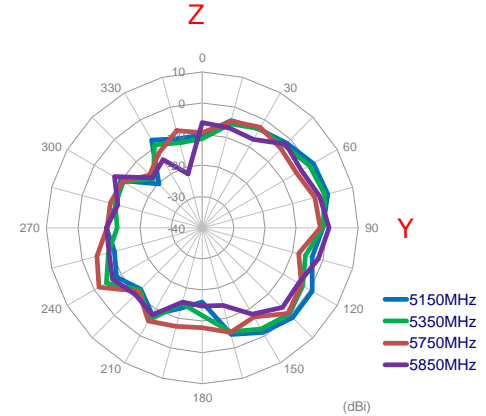
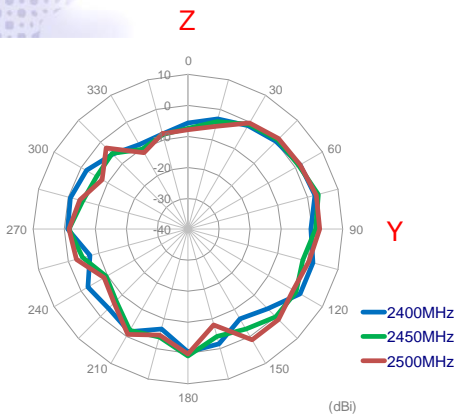
X-Y Plane



X-Z Plane



Y-Z Plane

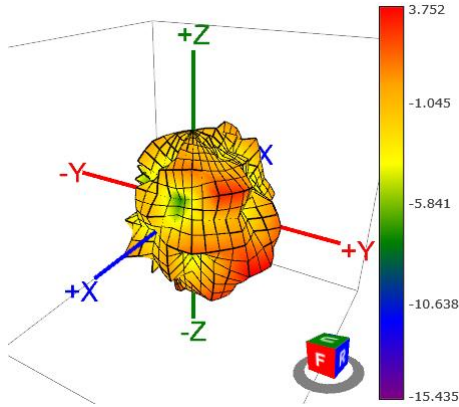


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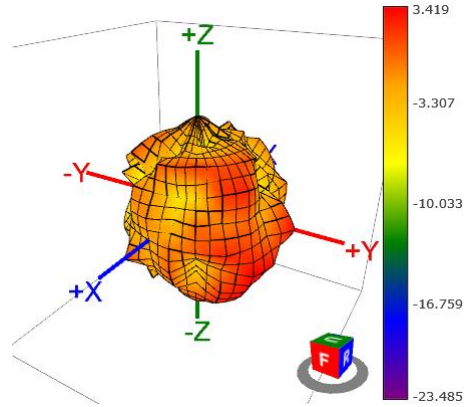
### IV. 3D Radiation Pattern:

Free Space - WiFi M

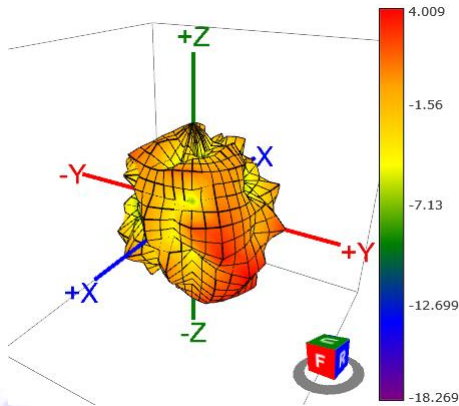
2400MHz



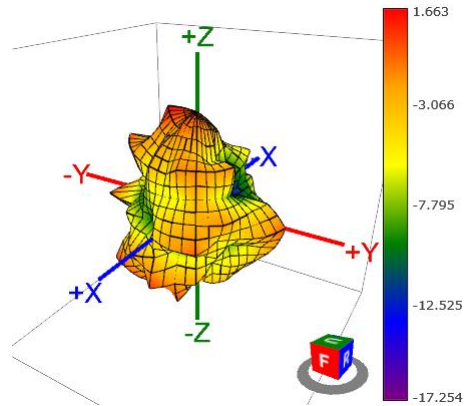
2450MHz



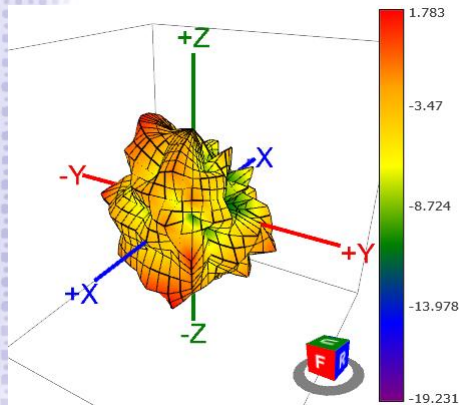
2500MHz



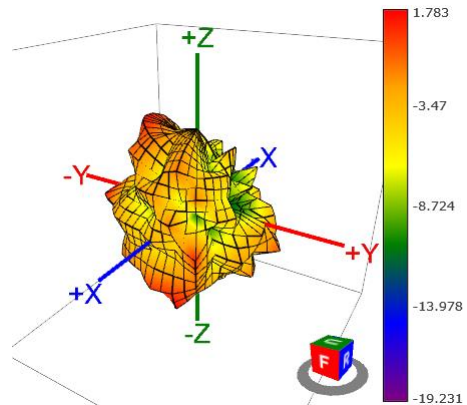
5150MHz



5350MHz

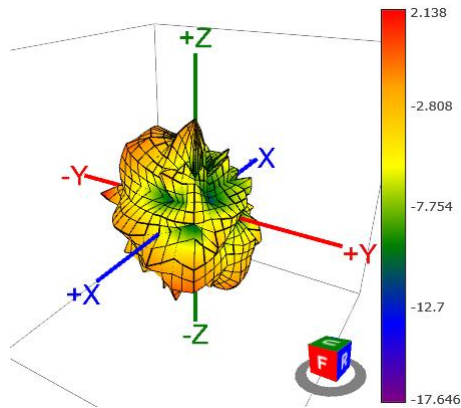


5750MHz



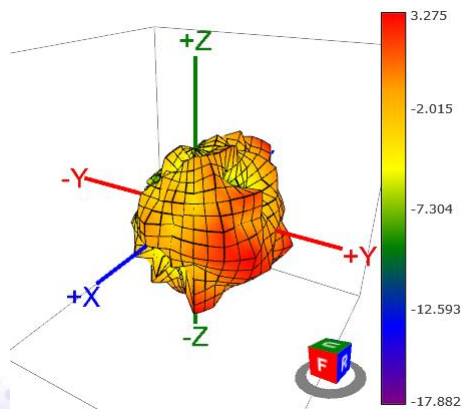
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5850MHz

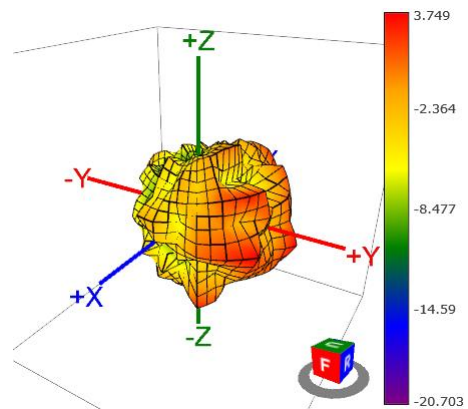


With Ground Plane –WiFi M

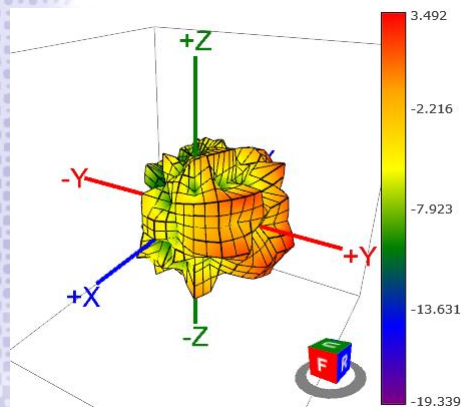
2400MHz



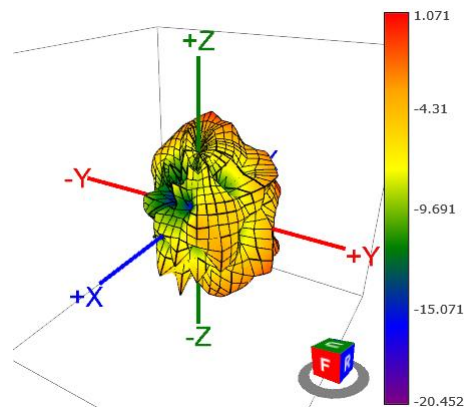
2450MHz



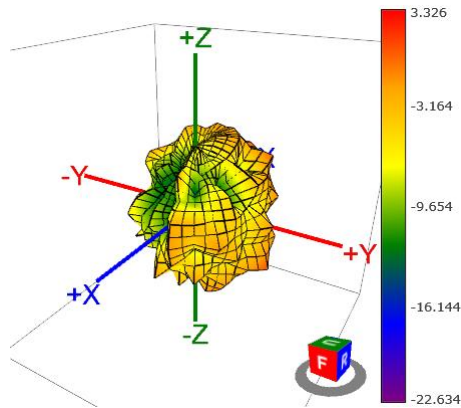
2500MHz



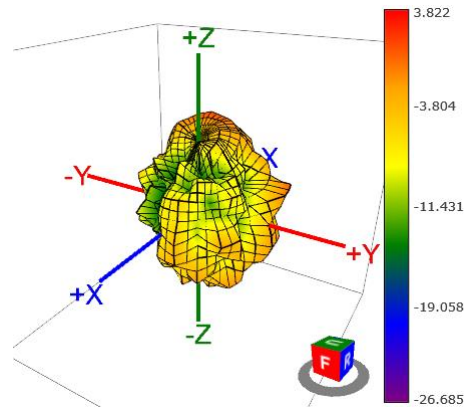
5150MHz



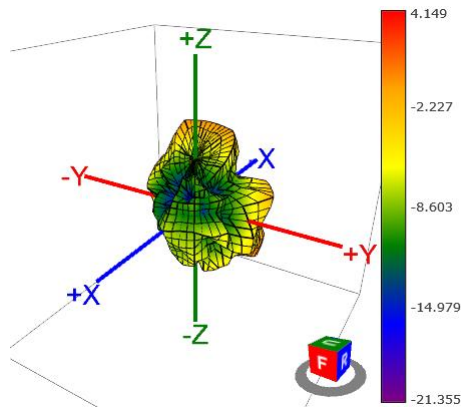
5350MHz



5750MHz

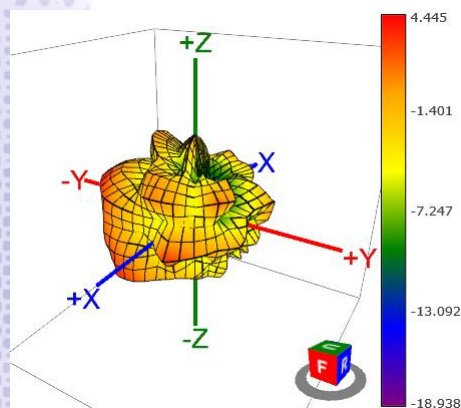


5850MHz

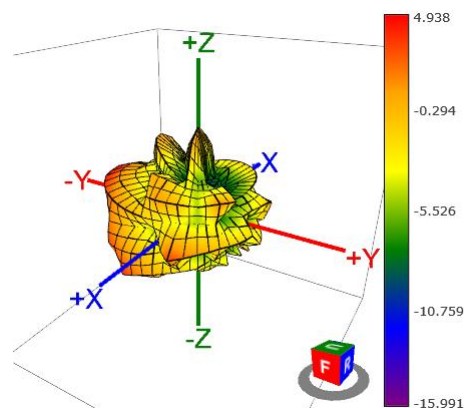


Free Space - WiFi A

2400MHz

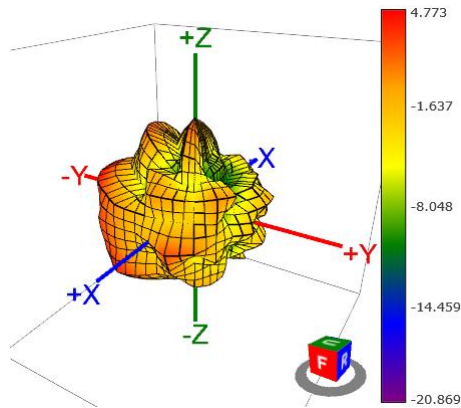


2450MHz

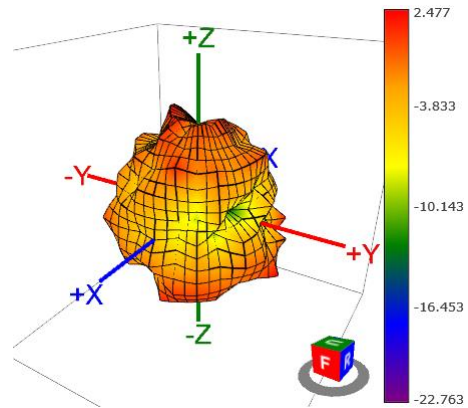


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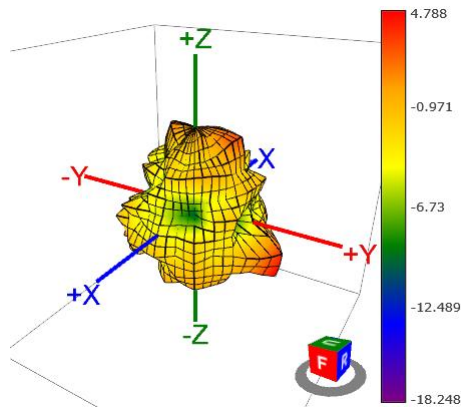
2500MHz



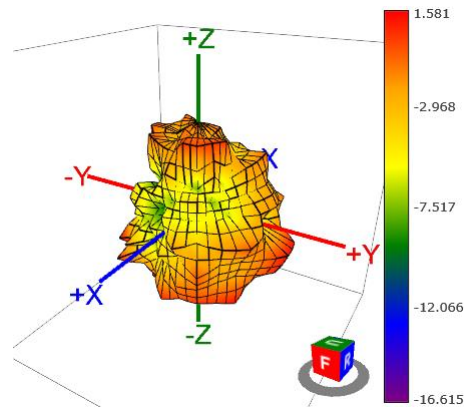
5150MHz



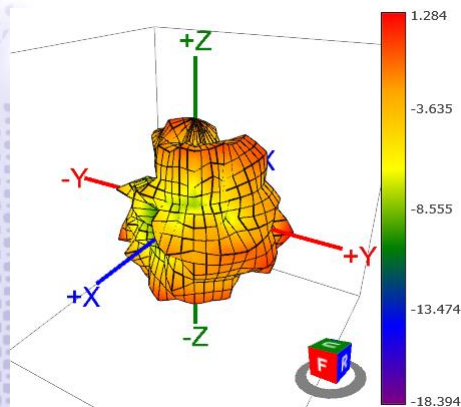
5350MHz



5750MHz



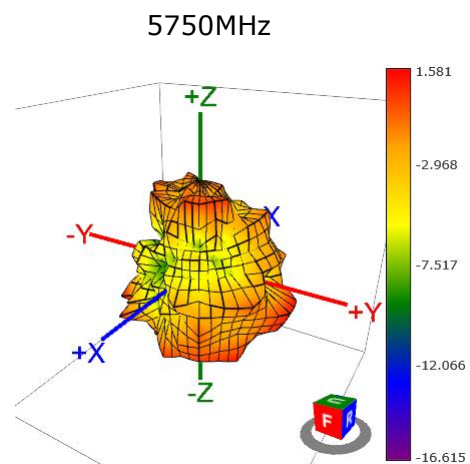
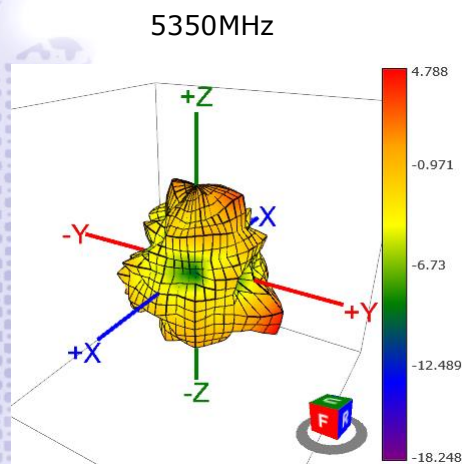
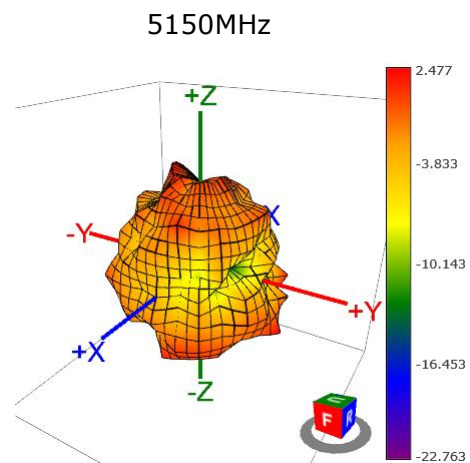
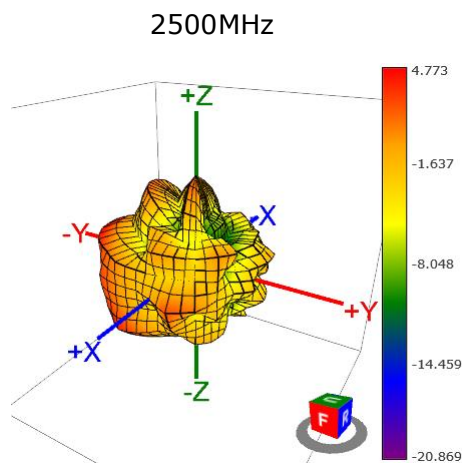
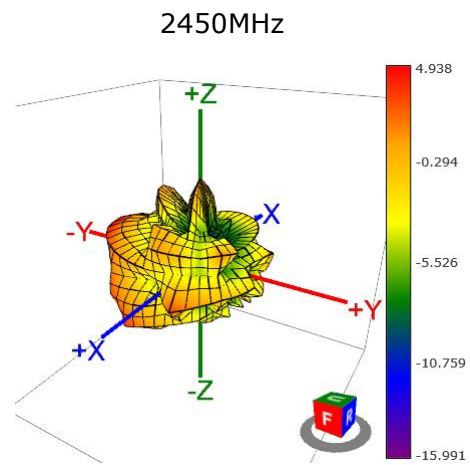
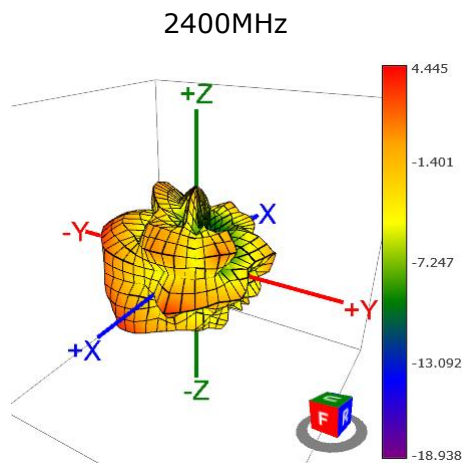
5850MHz



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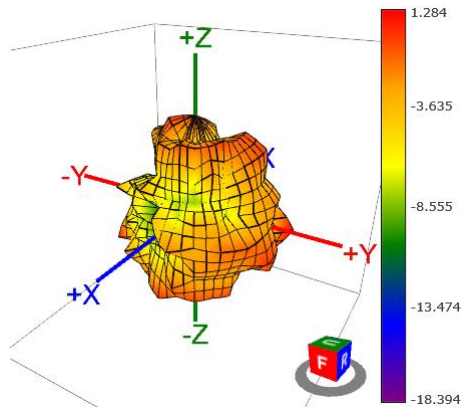


With Ground Plane –WiFi A



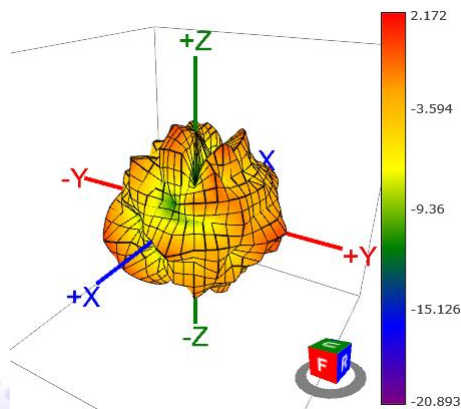
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5850MHz

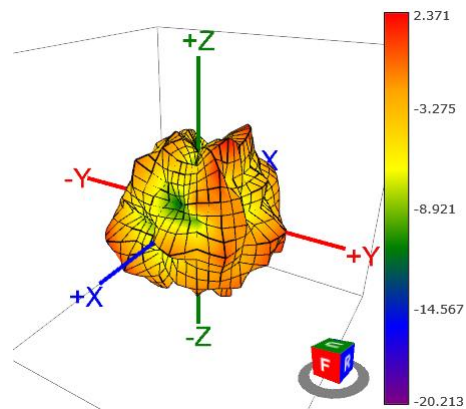


Free Space - BT

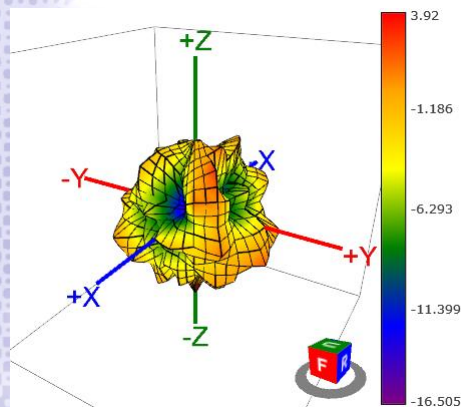
2400MHz



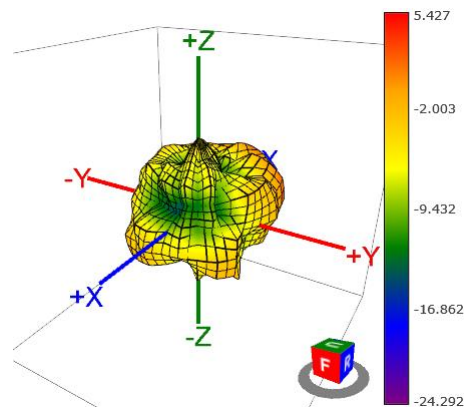
2450MHz



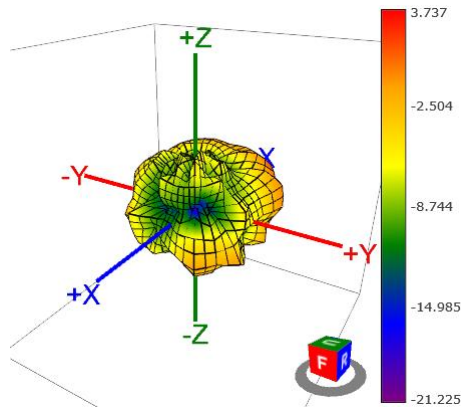
2500MHz



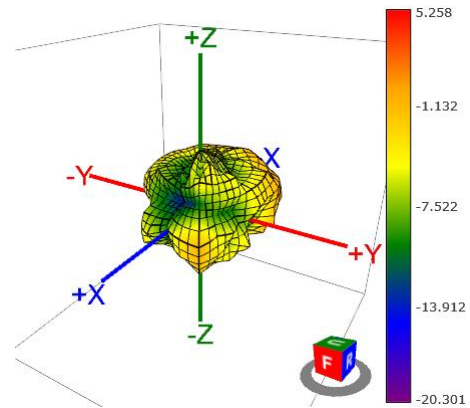
5150MHz



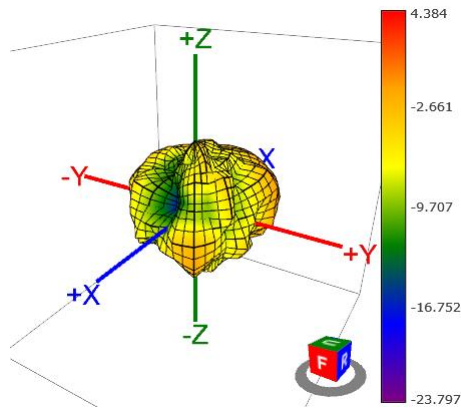
5350MHz



5750MHz

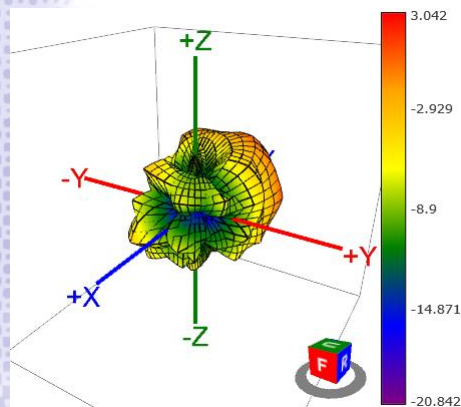


5850MHz

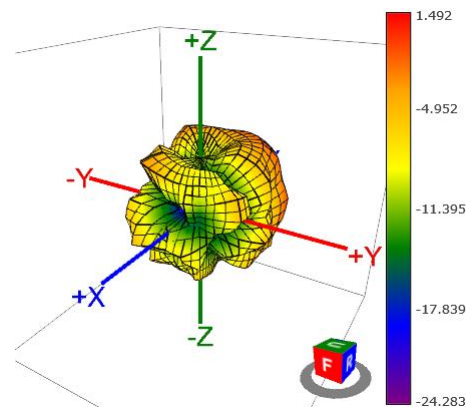


With Ground Plane - BT

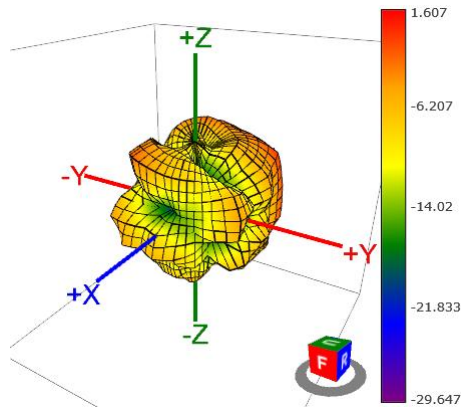
2400MHz



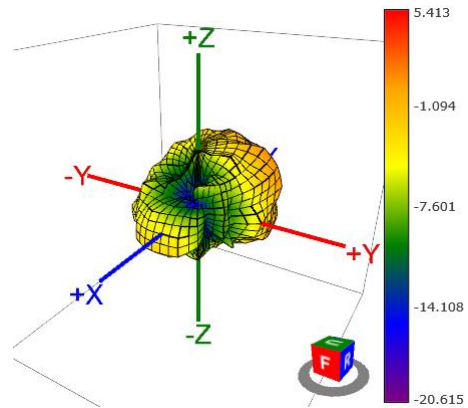
2450MHz



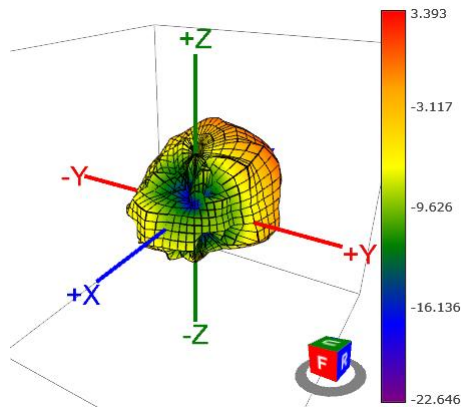
2500MHz



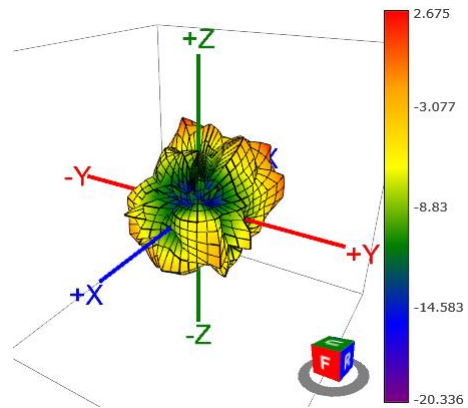
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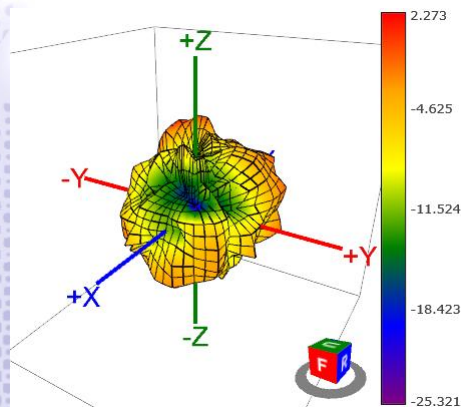
5350MHz



5750MHz

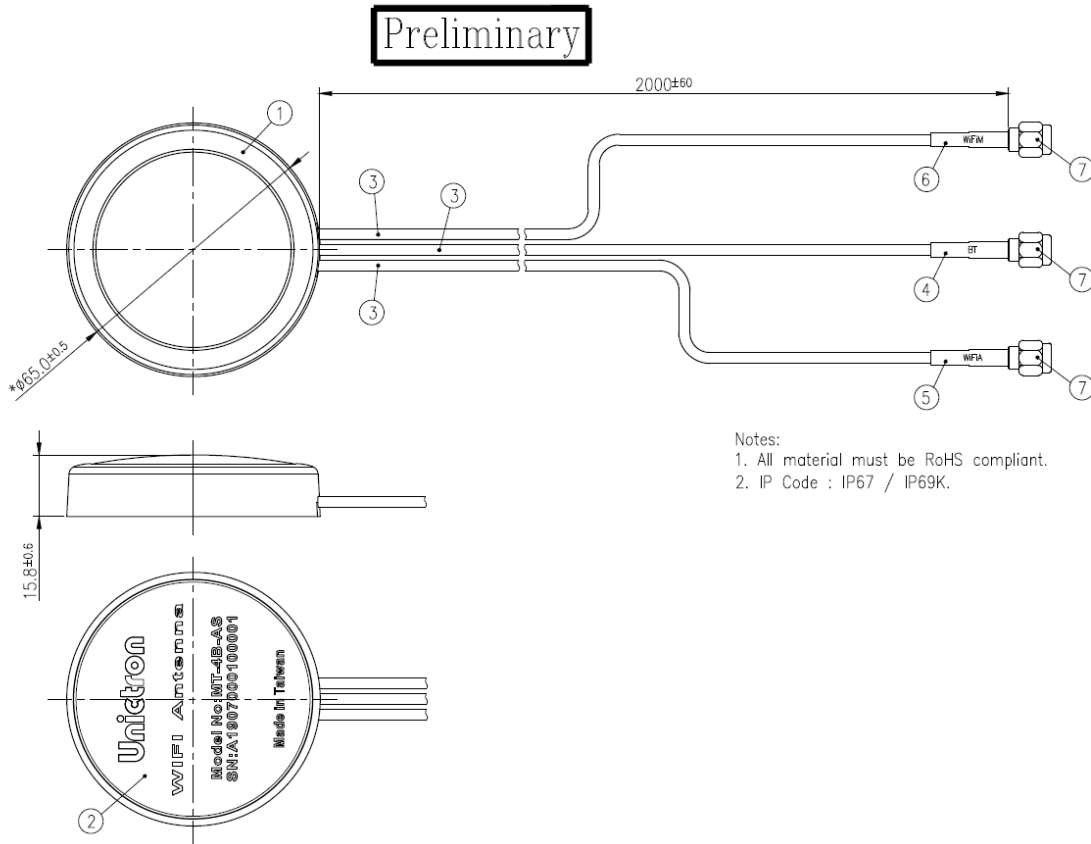


5850MHz



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## V. Mechanical Drawing (Unit:mm):



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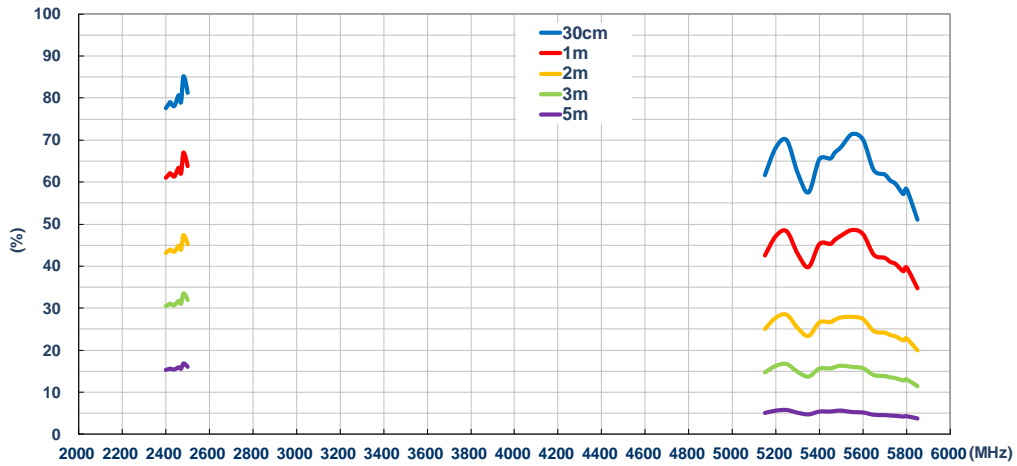
7	SMA(M) Connector	Brass	Au plating	3
6	WiFiM Heat Shrink Tube	CTMS	Yellow	1
5	WiFiA Heat Shrink Tube	CTMS	Yellow	1
4	BT Heat Shrink Tube	CTMS	Yellow	1
3	Cable H-100	PVC	Black	3
2	Label	PET	Silver	1
1	Housing	PC	Black	1
No	NAME	MATERIAL	FINISH	Q'TY

## VI. Applications Note:

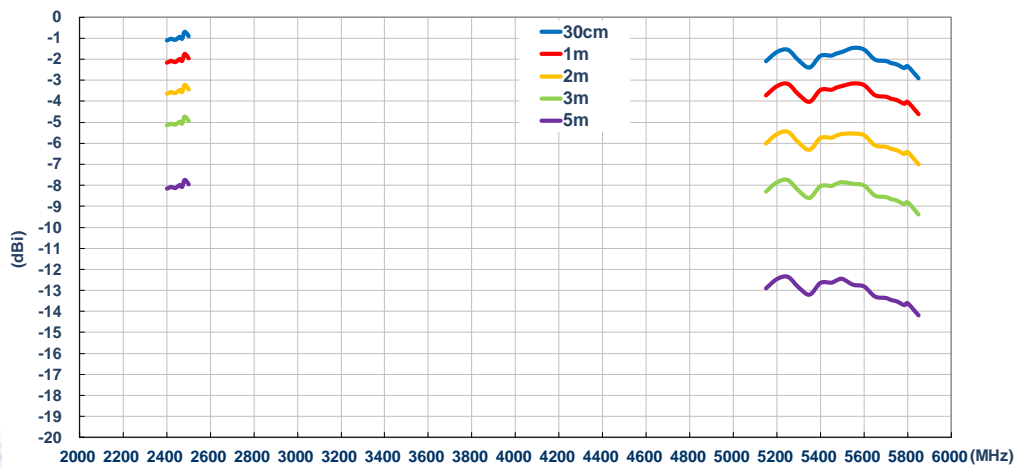
The antenna performance with different cable lengths is shown below.

Free Space – WiFi M

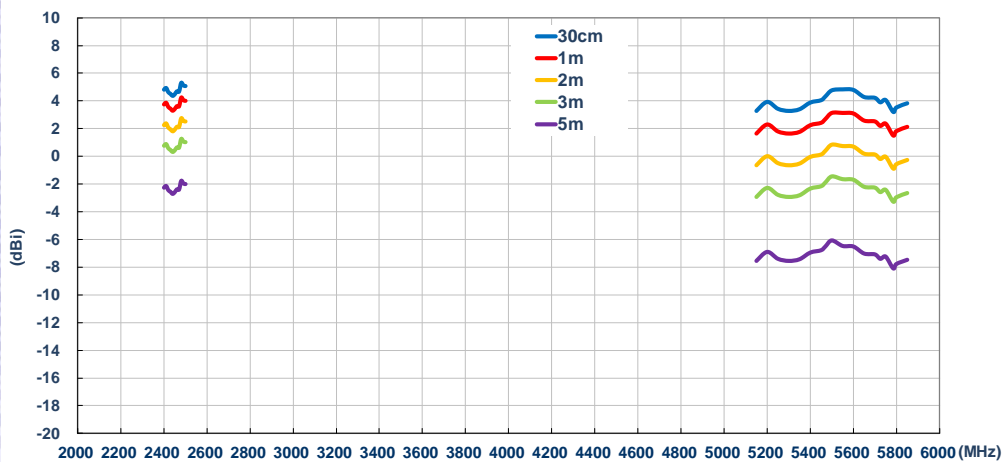
Efficiency (%)



Average Gain (dBi)

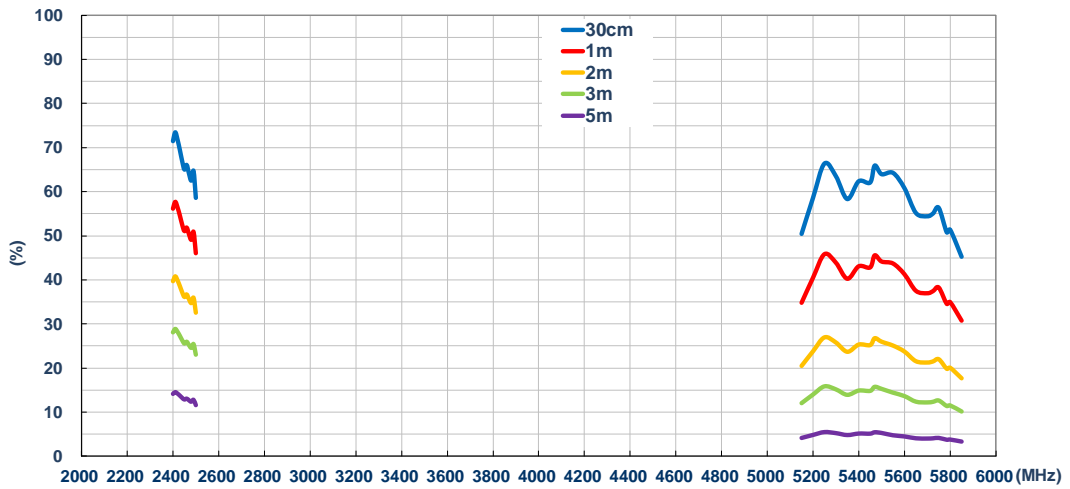


Peak Gain (dBi)

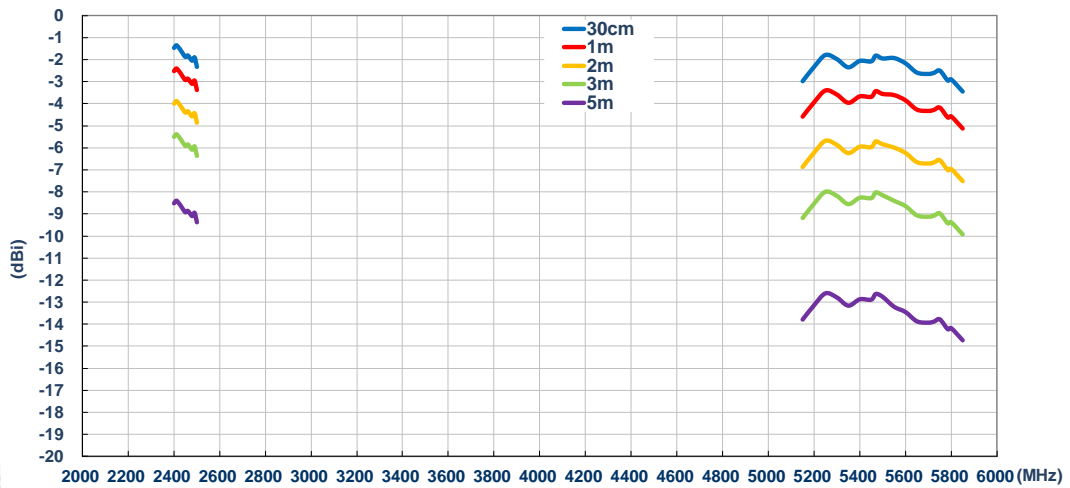


With Ground Plane – WiFi M

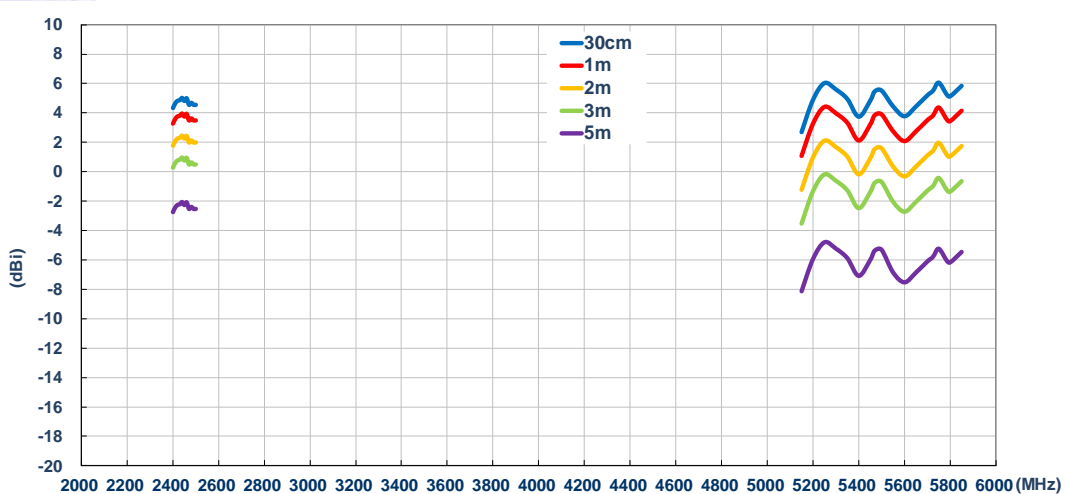
Efficiency (%)



Average Gain (dBi)



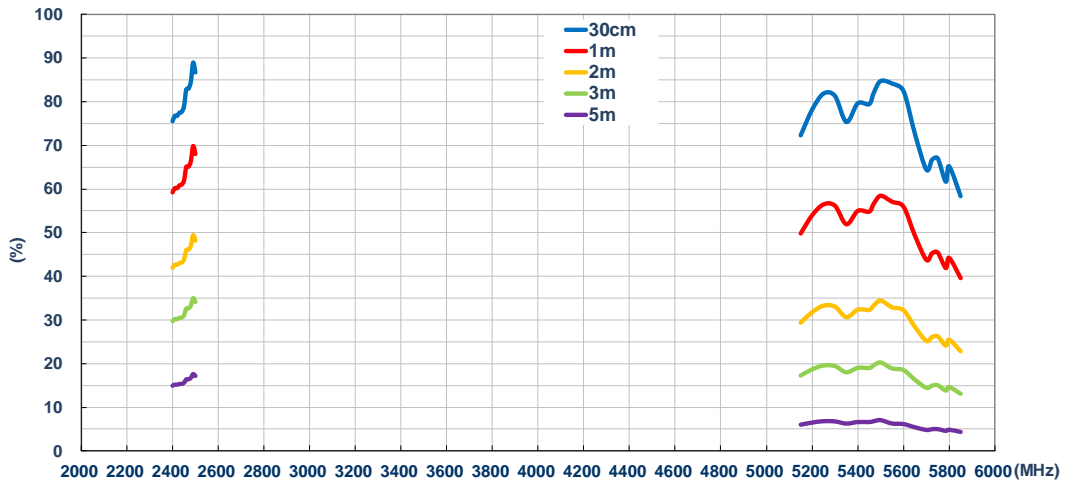
Peak Gain (dBi)



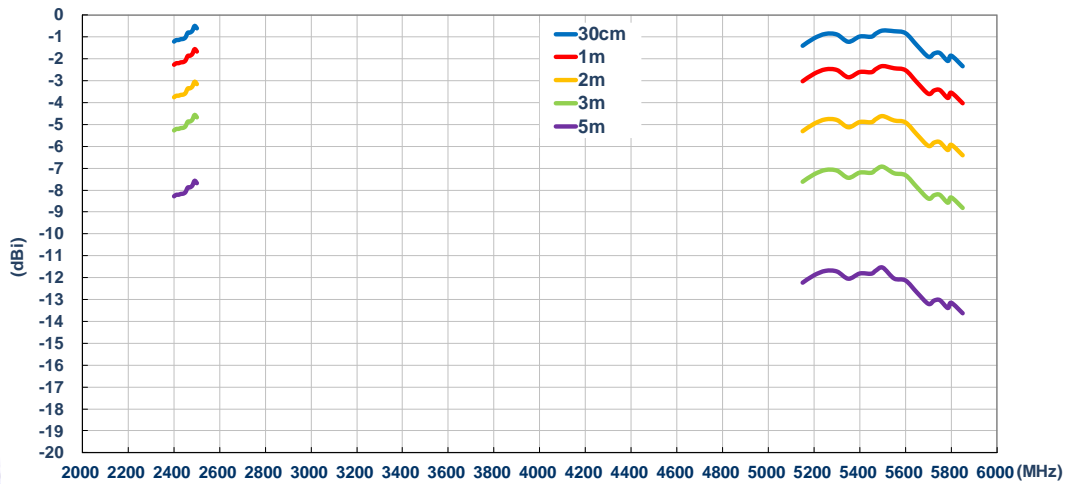
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### Free Space – WiFi A

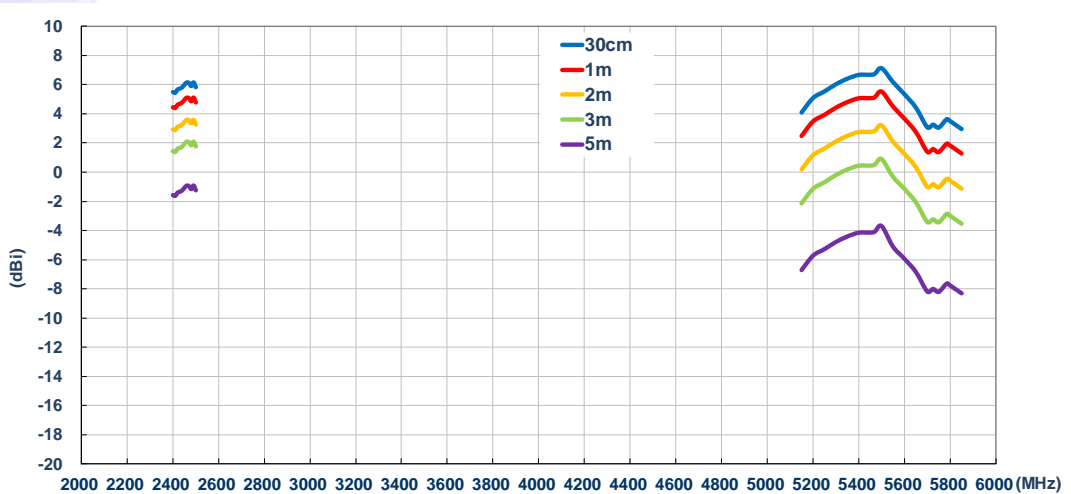
#### Efficiency (%)



#### Average Gain (dBi)



#### Peak Gain (dBi)

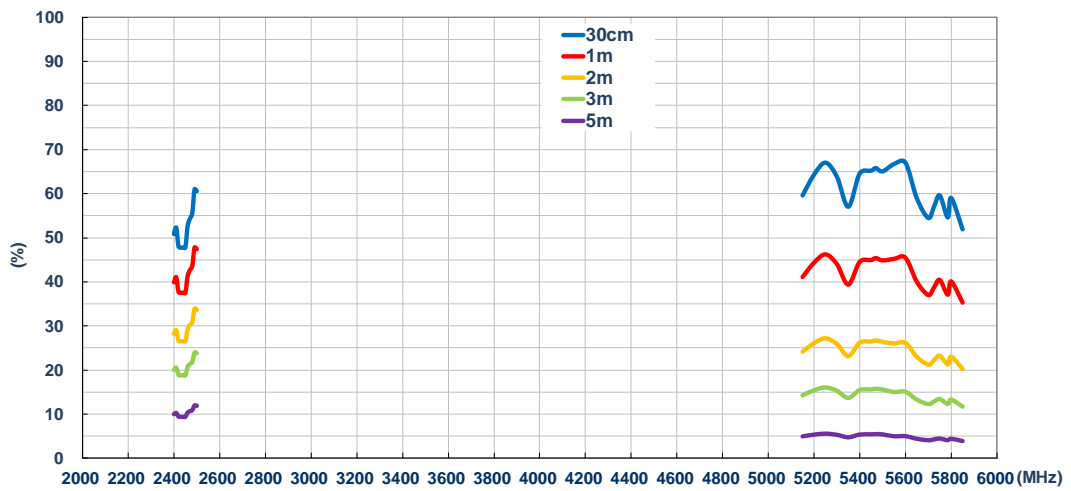


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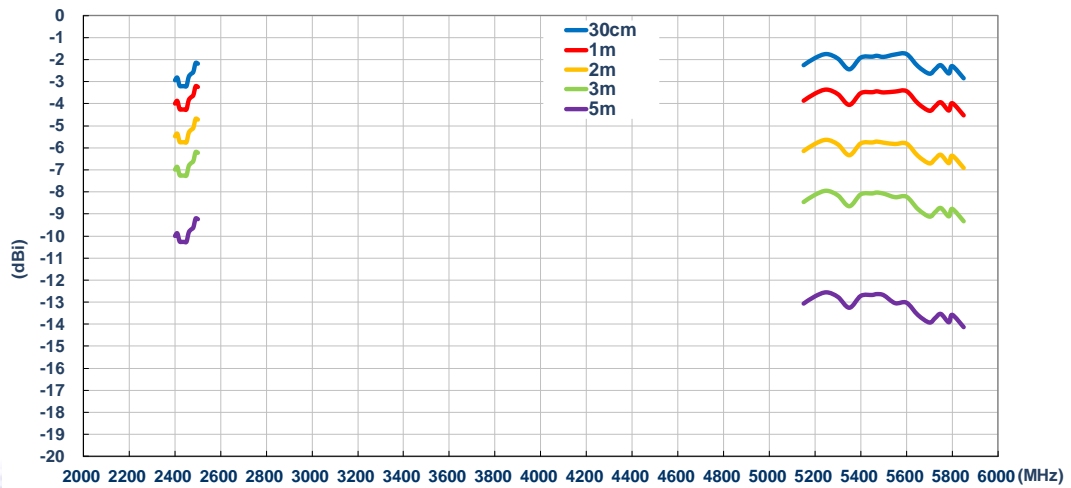


With Ground Plane – WiFi A

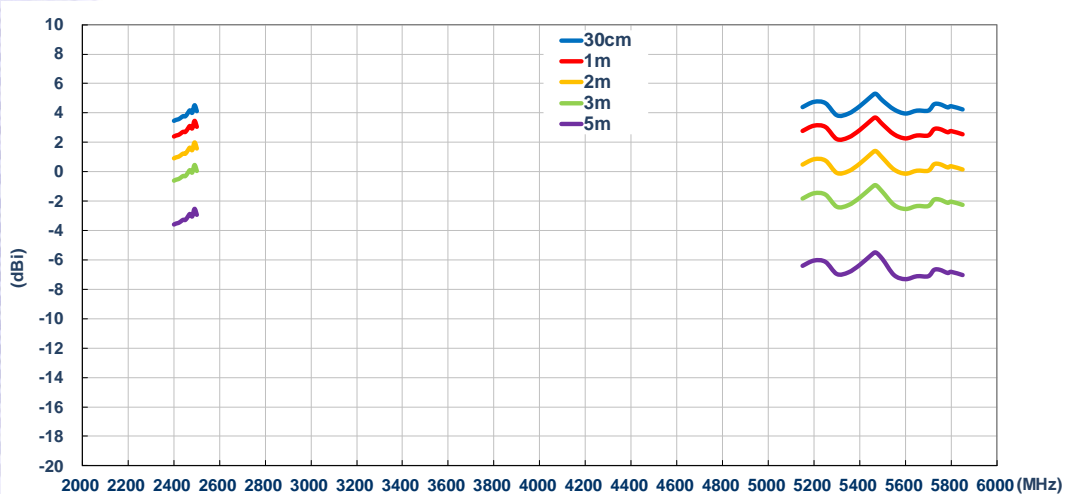
Efficiency (%)



Average Gain (dBi)

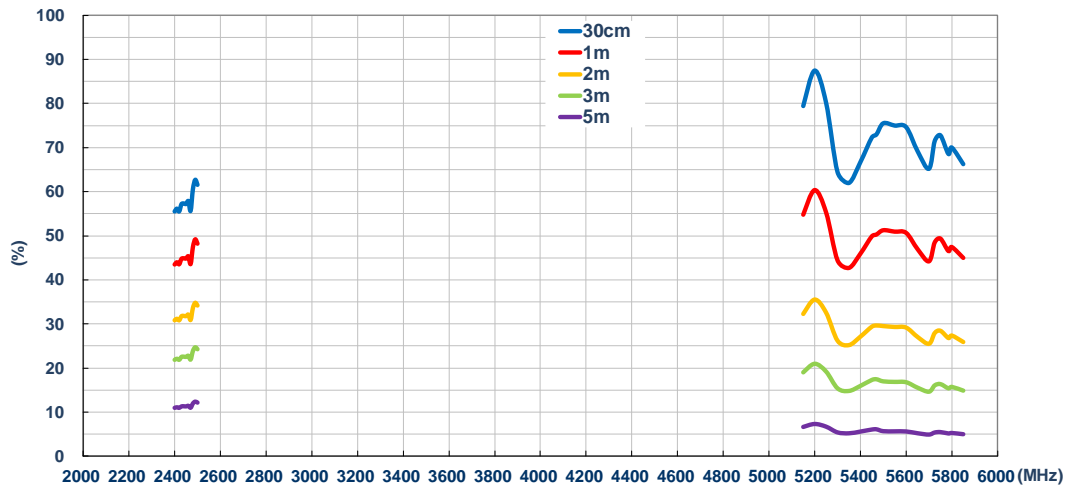


Peak Gain (dBi)



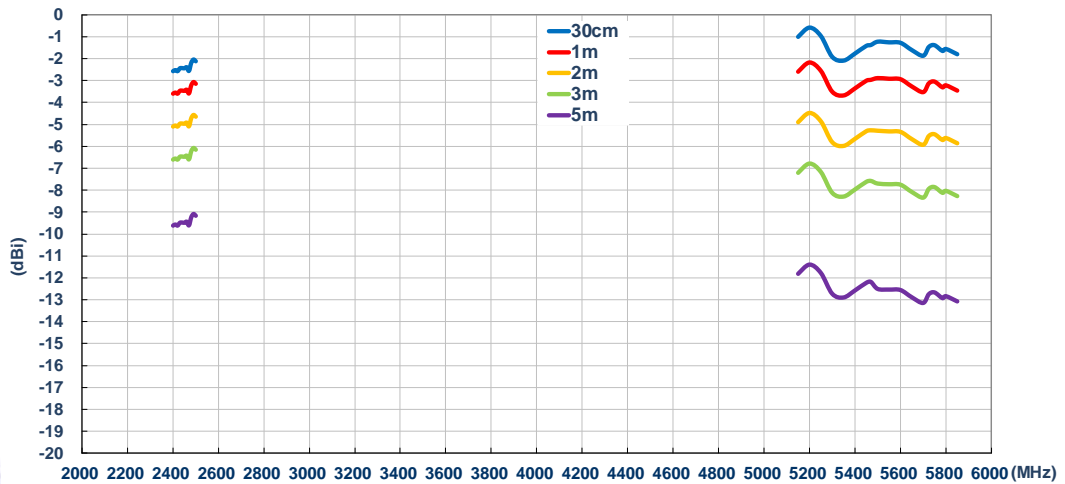
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Free Space – BT  
Efficiency (%)

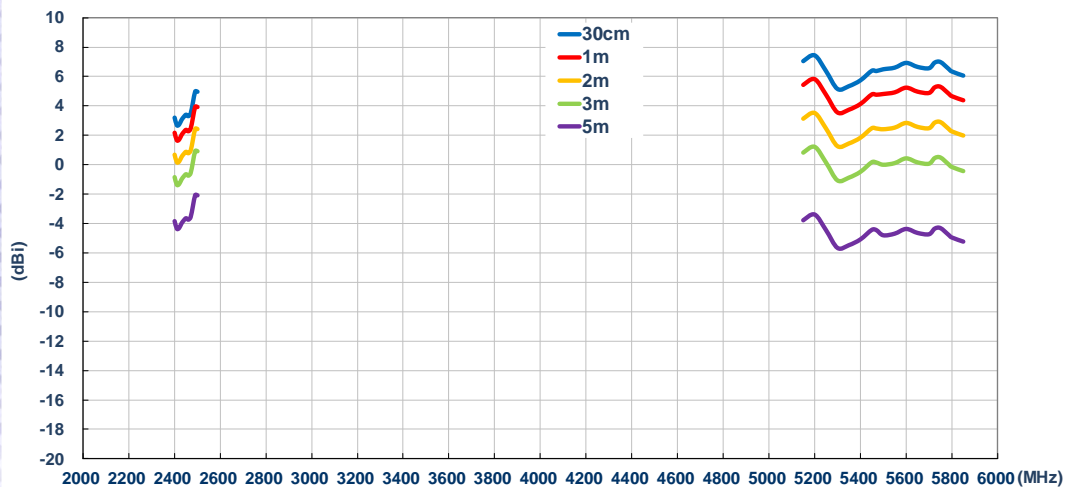


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Average Gain (dBi)

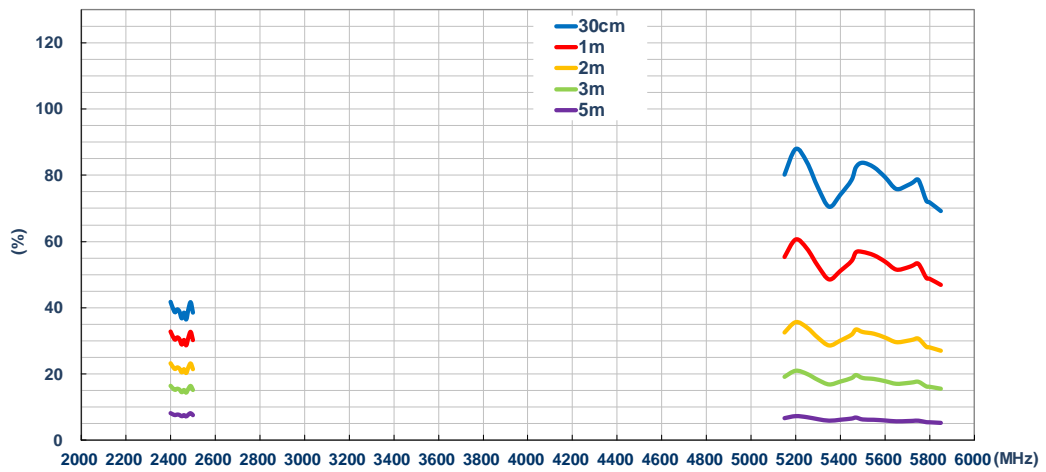


Peak Gain (dBi)

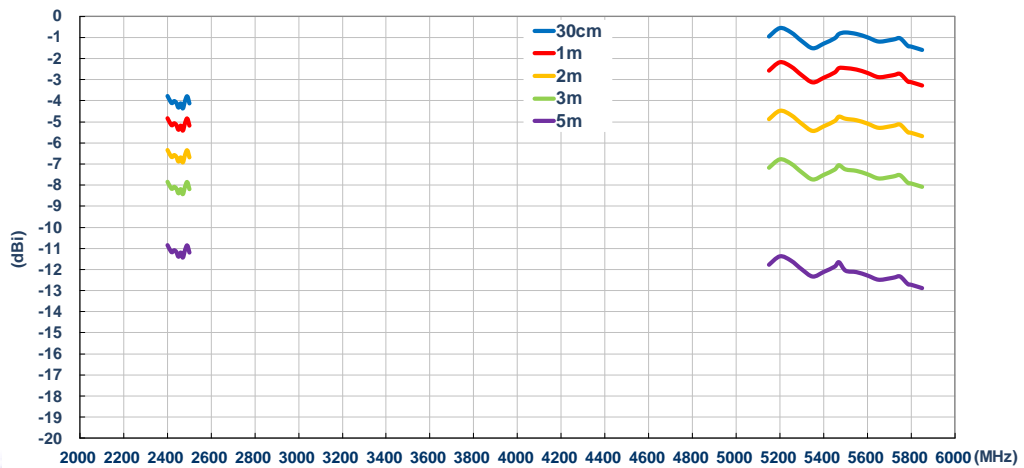


With Ground Plane – BT

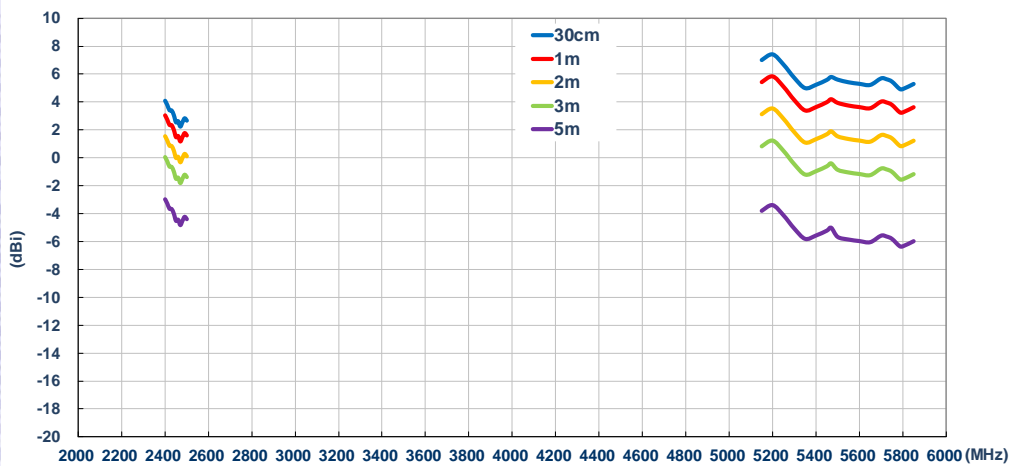
Efficiency (%)



Average Gain (dBi)



Peak Gain (dBi)



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