

AX13 Antenna

5G FR1*4 / WiFi Dual Band*2 Test Report

Antenna Summary	p.2
Antenna Isolation (5G FR1 ANT1)	p.3
Antenna Isolation (WiFi Dual Band ANT5&ANT6)	p.4
Antenna VSWR (5G FR1)	p.5
Antenna VSWR (WiFi Dual Band)	p.6
Antenna Pattern (5G FR1 ANT1)	p.7~12
Antenna Pattern (5G FR1 ANT2)	p.13~18
Antenna Pattern (5G FR1 ANT3)	p.19~24
Antenna Pattern (5G FR1 ANT4)	p.25~30
Antenna Pattern (WiFi Dual Band ANT5)	p.31
Antenna Pattern (WiFi Dual Band ANT6)	p.32

SUMMARY

Preliminary Specifications:

Cable OD1.37 L=250mm

LB(617-960MHz) / MB(1710-2690MHz) / HB(3300-4200MHz) / UHB(4400-5925MHz)

ISOLATION

5G FR1 : 7 dB / 15 dB / 15 / 20 dB @LB / MB / HB / UHB

WiFi : 20 dB / 20 dB @ 2GHz / 5GHz

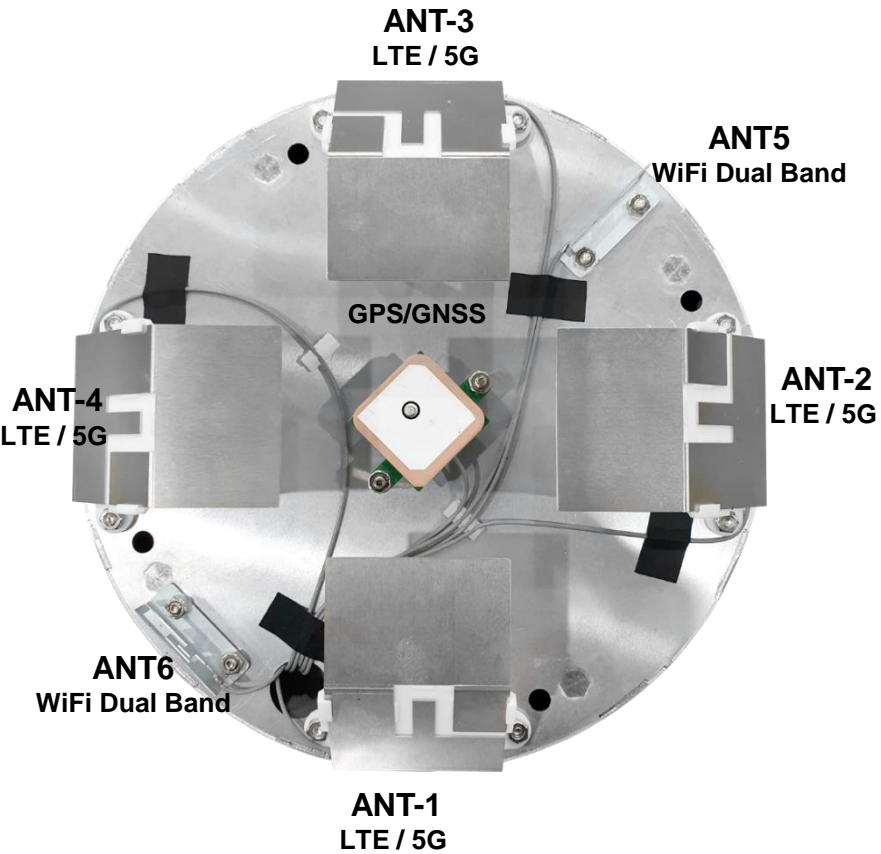
EFFICIENCY

5G FR1 : 31~52% / 42~75% / 62~71% / 46~65% @ LB / MB / HB / UHB

WiFi : 59~68% / 61~65% @ 2.4GHz / 5GHz

Antenna reflection OD Dimension

OD 180.0mm



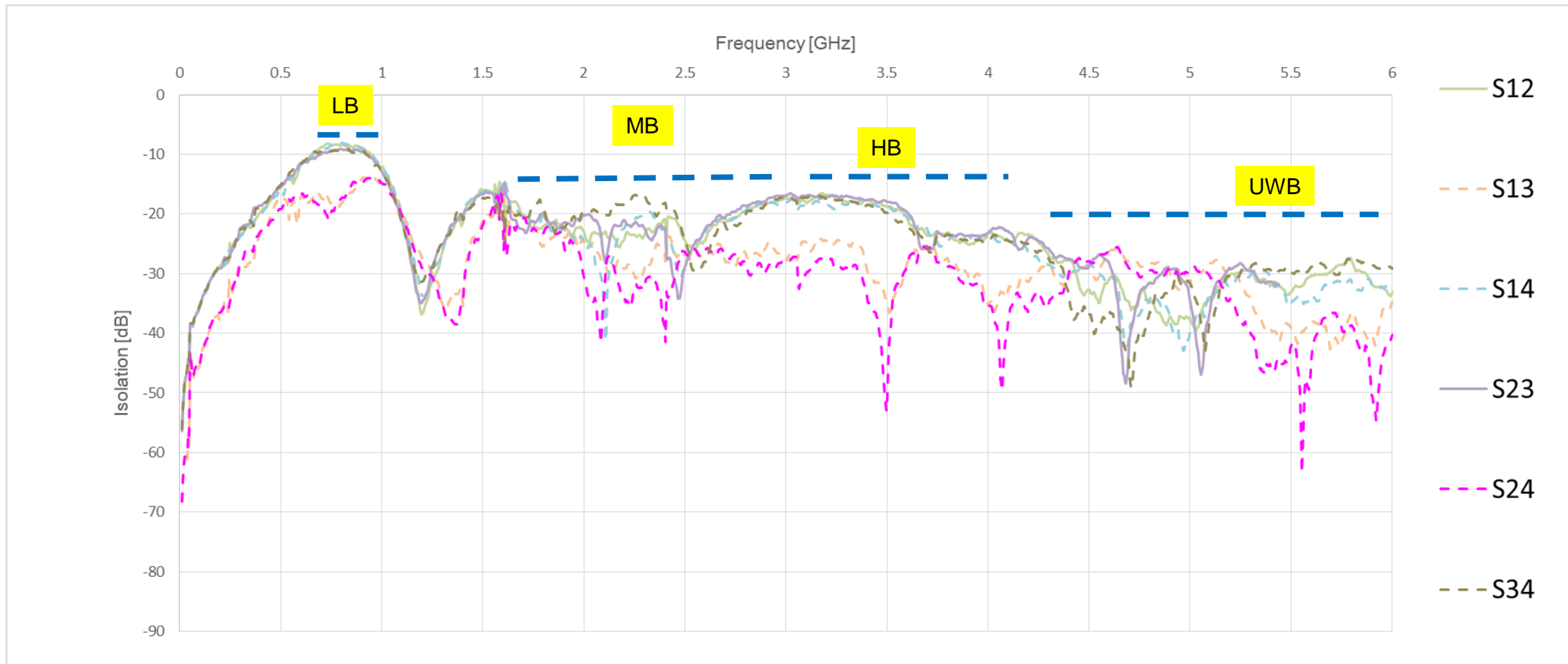
Antenna Isolation – 5G FR1

LB < -7 dB typ.

MB < -15 dB typ.

HB < -15 dB typ.

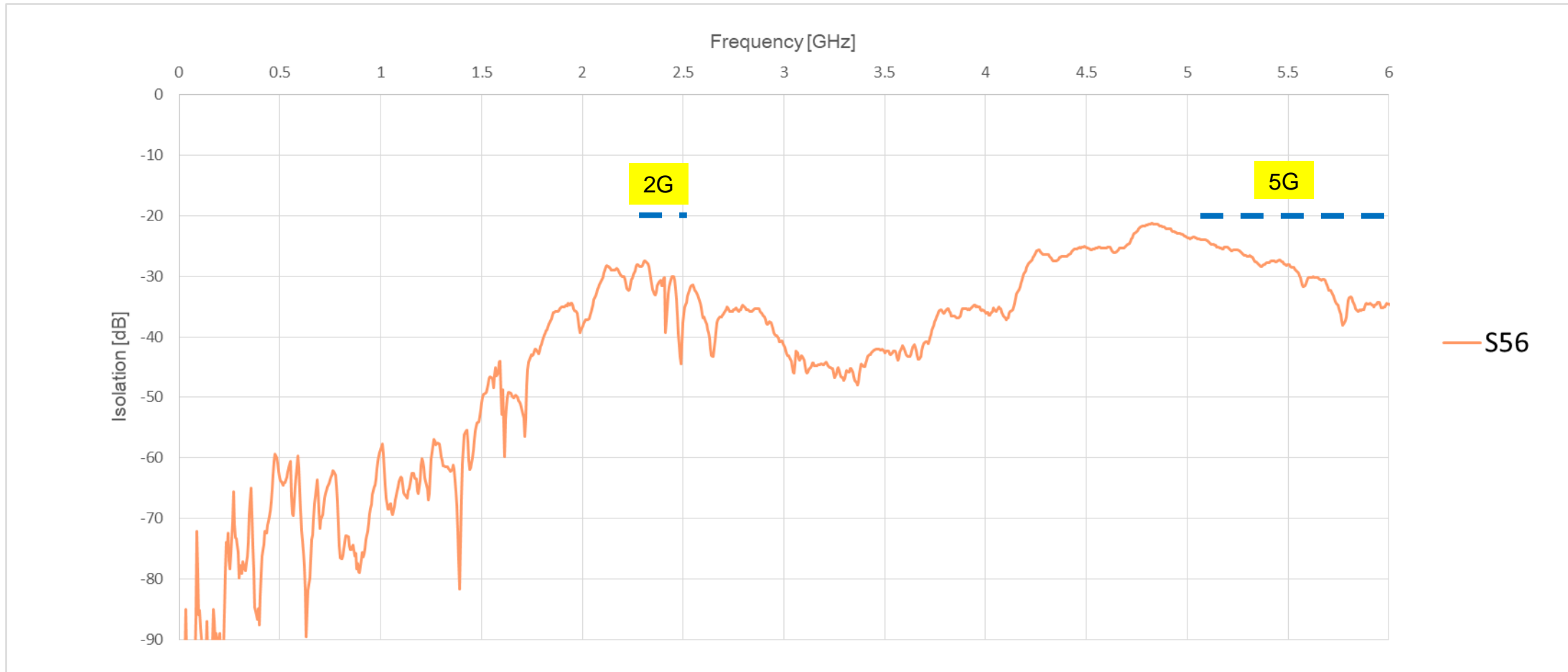
UWB < -20 dB typ.



Antenna Isolation - WiFi Dual Band

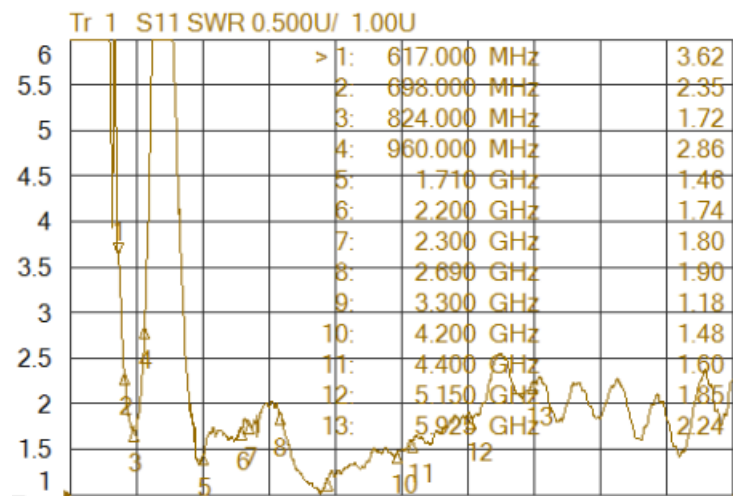
2GHz < -20 dB typ.

5GHz < -20 dB typ.

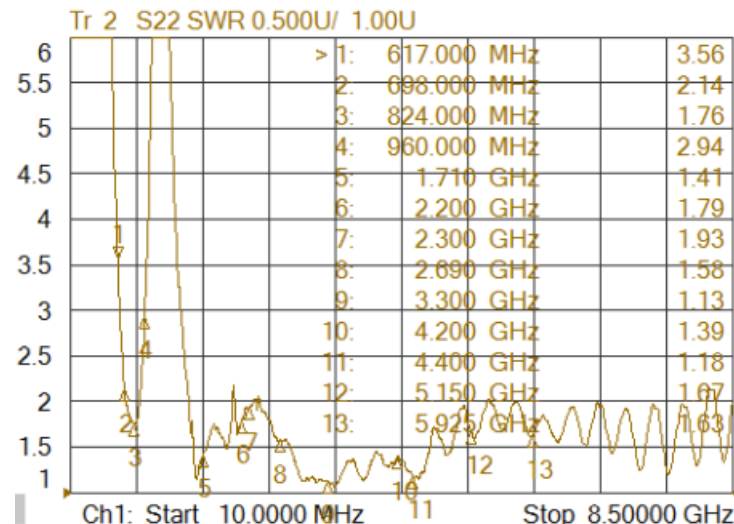


VSWR – 5G FR1

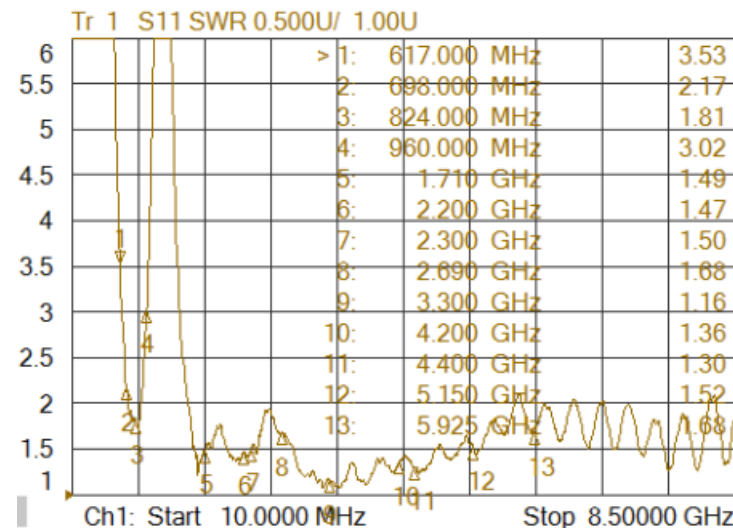
ANT-1



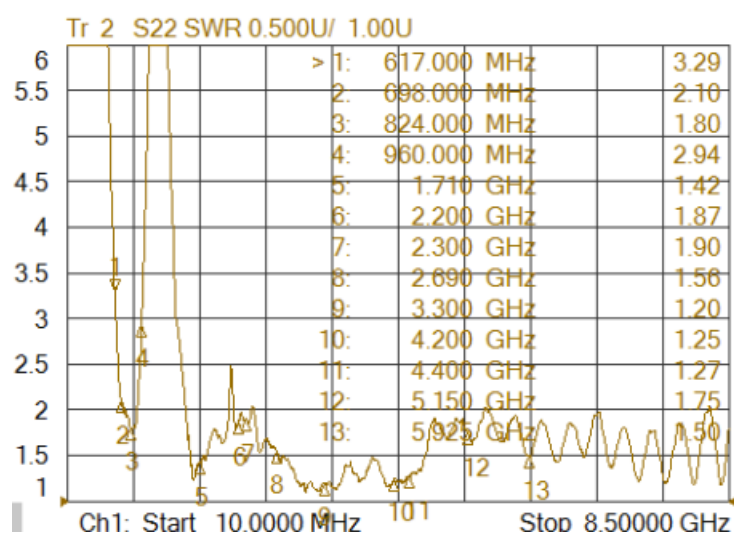
ANT-2



ANT-3

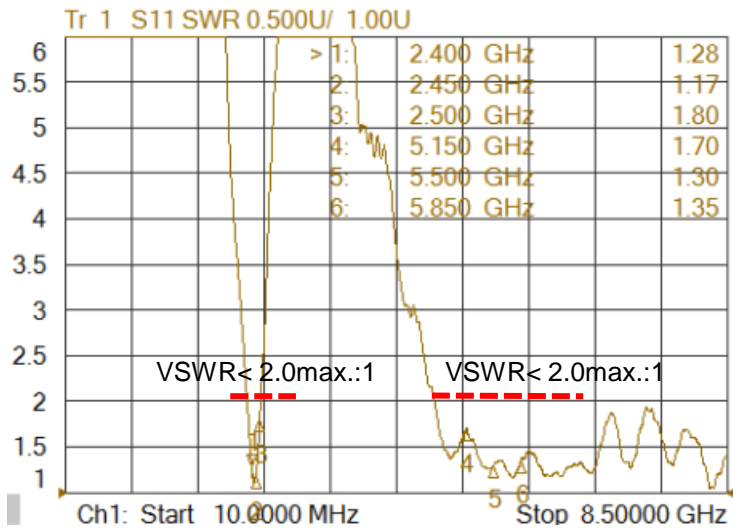


ANT-4

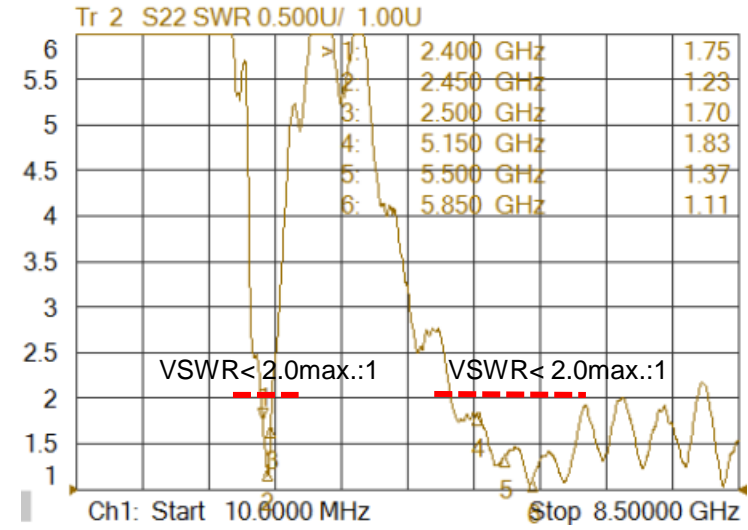


VSWR – WiFi

ANT-5



ANT-6

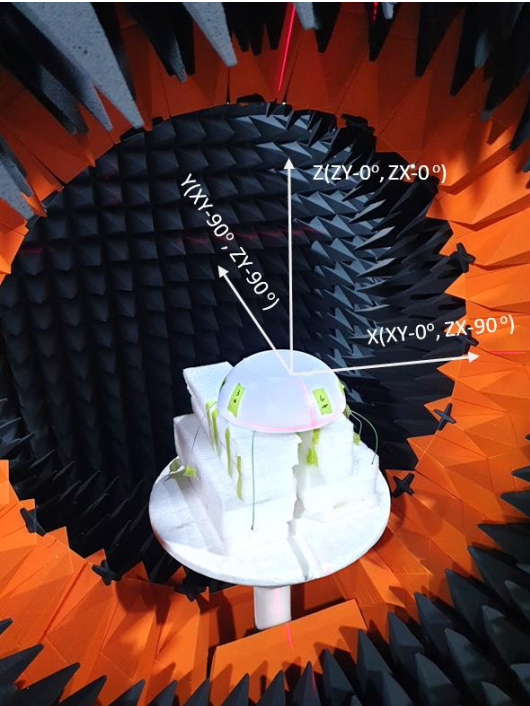


Pattern ANT-1 (5G FR1)

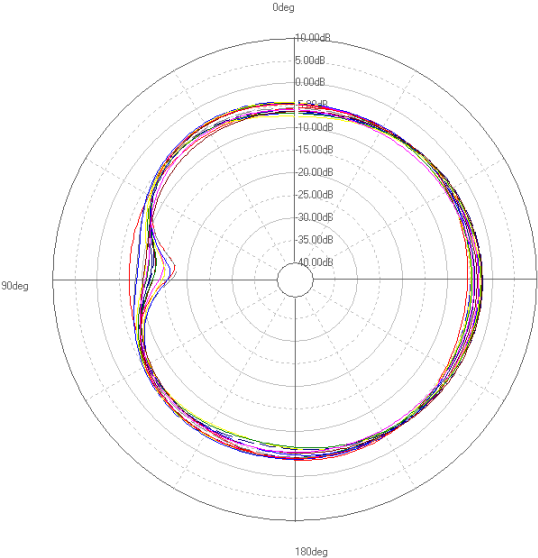
Legend

- 617.00(MHz)
- 652.00(MHz)
- 663.00(MHz)
- 698.00(MHz)
- 710.00(MHz)
- 734.00(MHz)
- 751.00(MHz)
- 768.00(MHz)
- 798.00(MHz)
- 824.00(MHz)
- 849.00(MHz)
- 869.00(MHz)
- 894.00(MHz)
- 900.00(MHz)
- 925.00(MHz)
- 960.00(MHz)

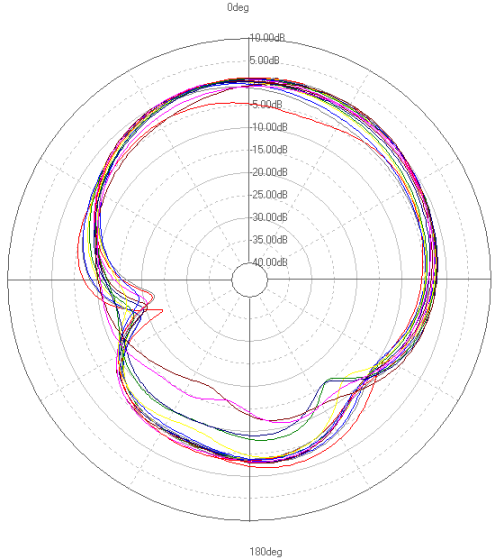
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
617	32%	-5.0	-1.7
652	35%	-4.6	-0.6
663	38%	-4.2	0.0
698	40%	-4.0	0.2
710	40%	-3.9	0.2
734	42%	-3.8	0.2
751	44%	-3.6	0.3
768	46%	-3.4	0.7
798	48%	-3.2	1.2
824	46%	-3.4	1.1
849	44%	-3.6	0.7
869	42%	-3.8	0.9
894	41%	-3.9	0.8
900	41%	-3.9	0.9
925	38%	-4.2	1.1
960	35%	-4.6	0.3



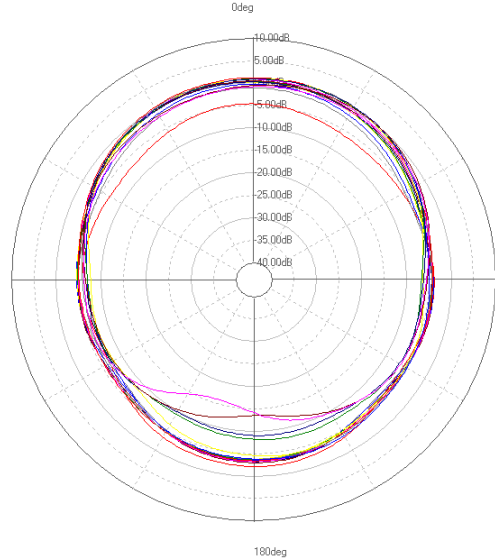
XY-plane



YZ-plane



ZX-plane

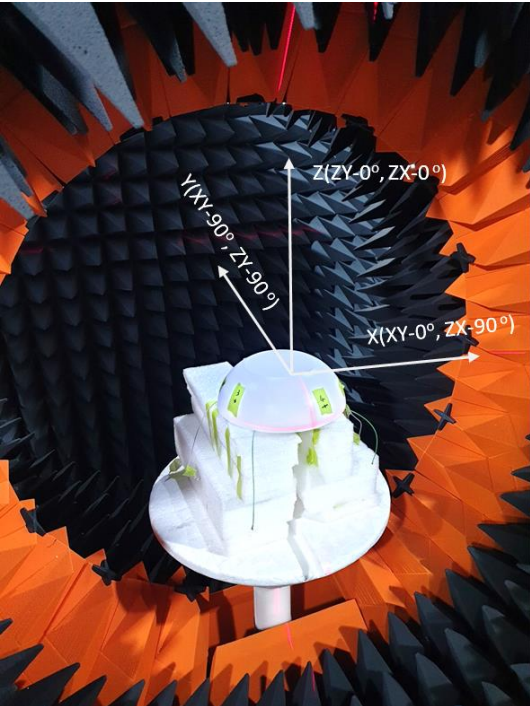


Pattern ANT-1 (5G FR1)

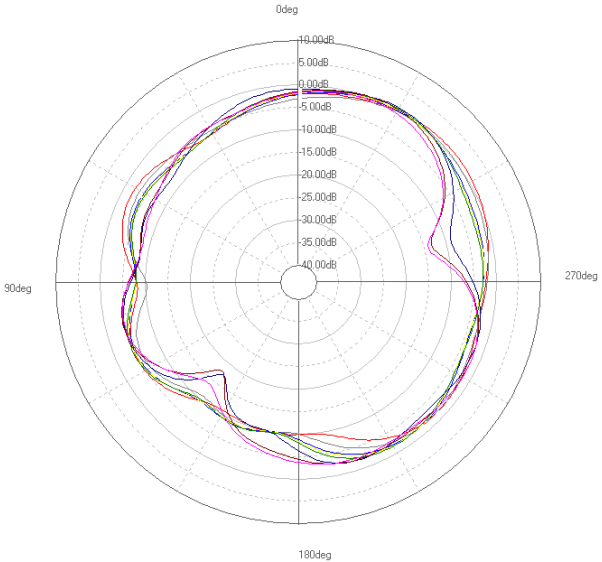
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
1710	75%	-1.2	2.4
1805	69%	-1.6	3.05
1880	70%	-1.6	3.05
1900	69%	-1.6	3.04
1920	70%	-1.6	3.05
2110	71%	-1.5	5.6
2170	70%	-1.6	5.4
2200	70%	-1.5	5.5

Legend

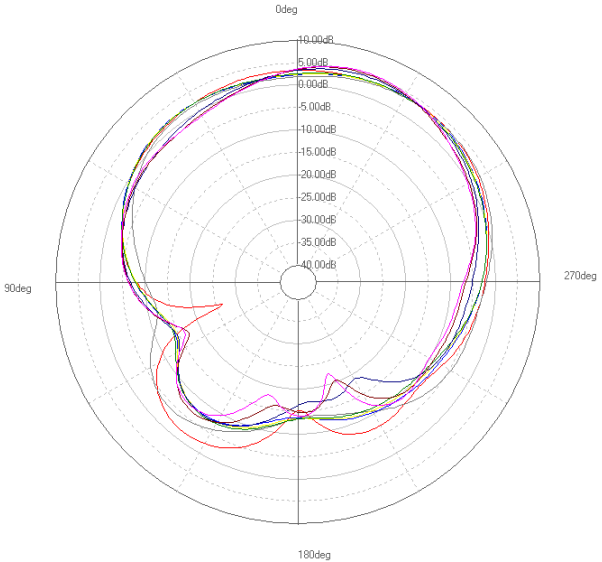
- 1710.00(MHz)
- 1805.00(MHz)
- 1880.00(MHz)
- 1900.00(MHz)
- 1920.00(MHz)
- 2110.00(MHz)
- 2170.00(MHz)
- 2200.00(MHz)



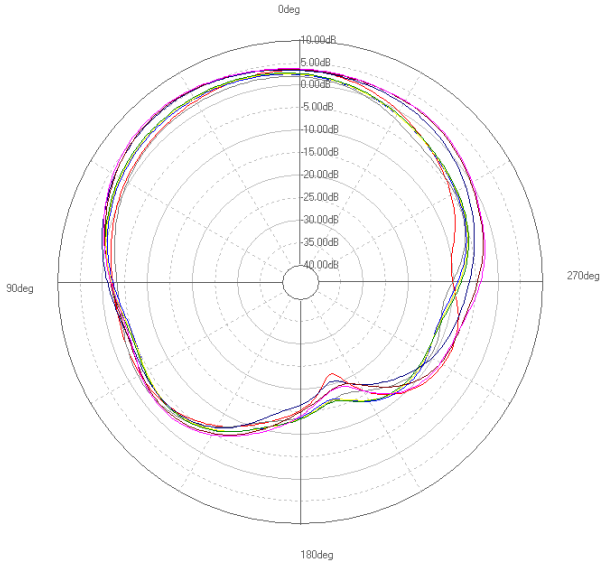
XY-plane



YZ-plane



ZX-plane

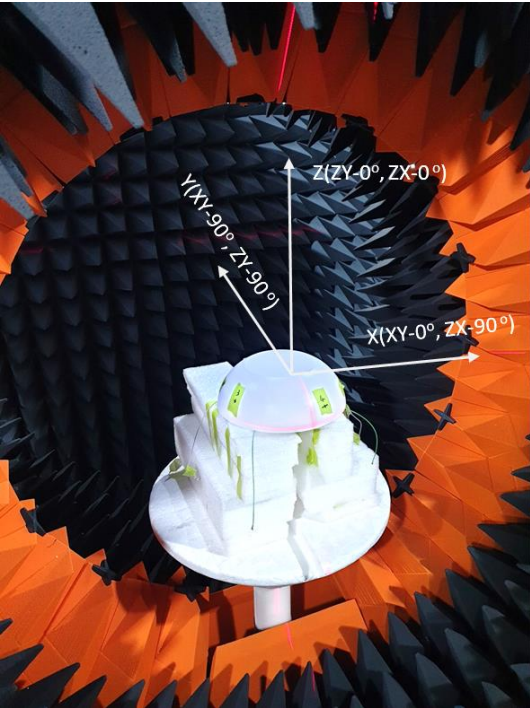


Pattern ANT-1 (5G FR1)

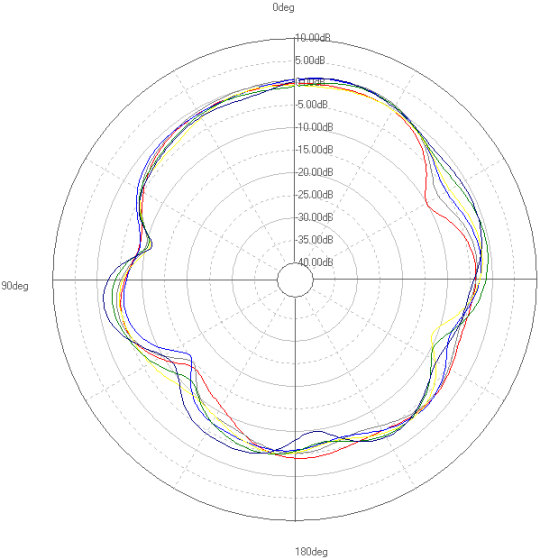
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
2300	72%	-1.4	-2.1
2350	69%	-1.6	-2.2
2400	65%	-1.9	3.09
2500	64%	-1.9	3.11
2595	68%	-1.7	3.12
2690	66%	-1.8	3.10

Legend

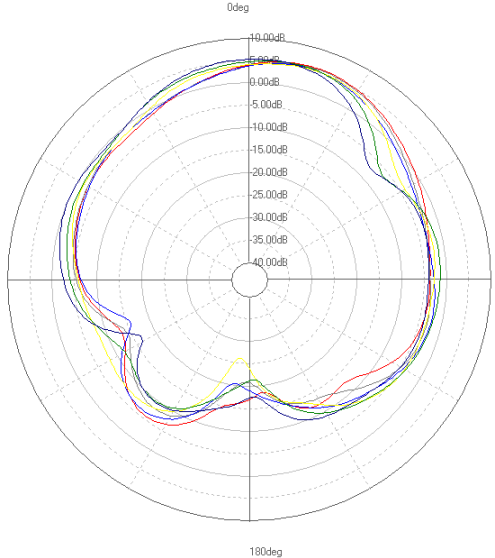
- 2300.00(MHz)
- 2350.00(MHz)
- 2400.00(MHz)
- 2500.00(MHz)
- 2595.00(MHz)
- 2690.00(MHz)



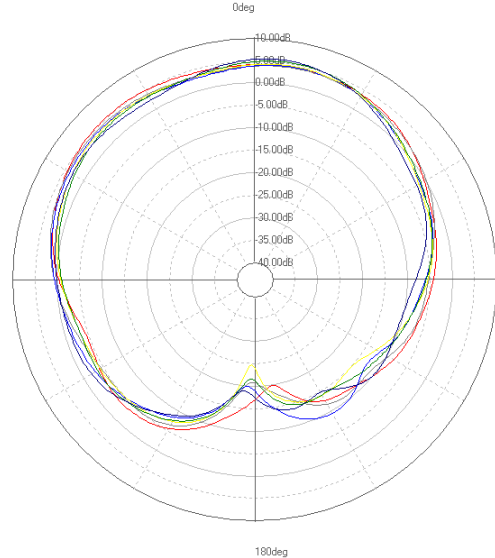
XY-plane



YZ-plane



ZX-plane

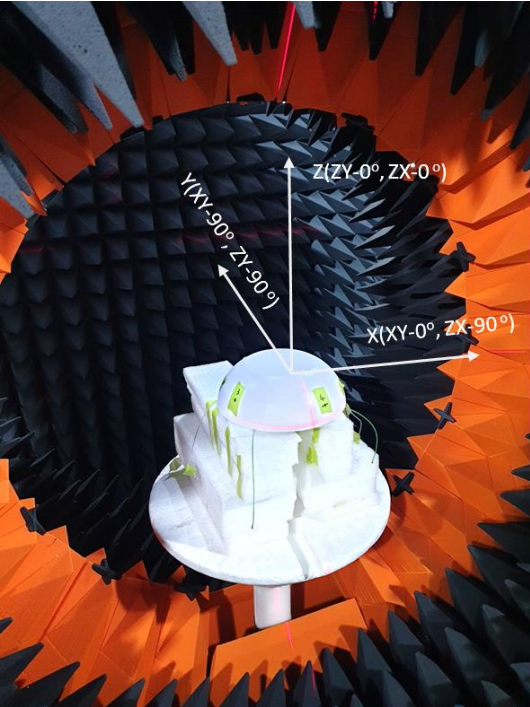


Pattern ANT-1 (5G FR1)

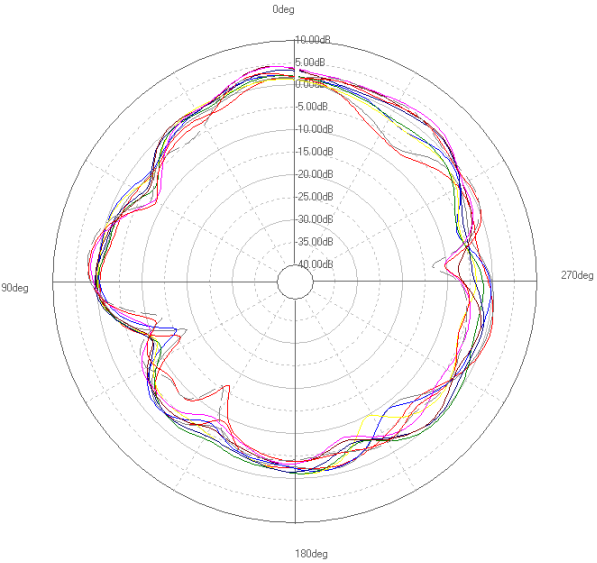
Legend

- 3300.00(MHz)
- 3400.00(MHz)
- 3500.00(MHz)
- 3600.00(MHz)
- 3700.00(MHz)
- 3800.00(MHz)
- 3900.00(MHz)
- 4000.00(MHz)
- 4100.00(MHz)
- 4200.00(MHz)

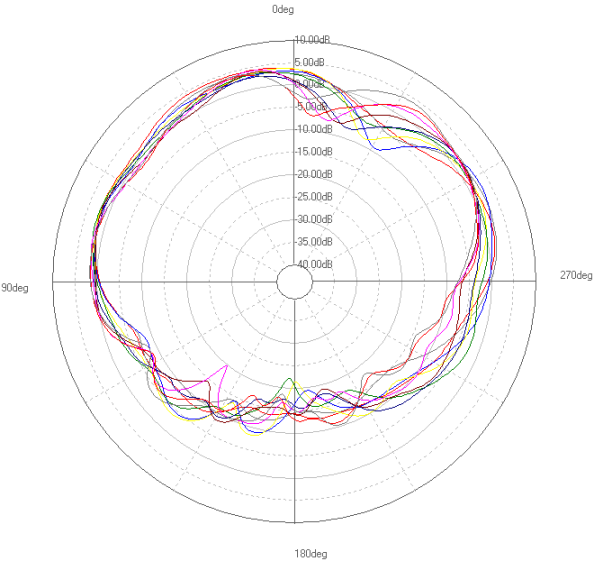
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
3300	71%	-1.5	5.1
3400	69%	-1.6	4.7
3500	68%	-1.7	-2.1
3600	68%	-1.7	-2.1
3700	71%	-1.5	-2.1
3800	71%	-1.5	5.4
3900	68%	-1.7	5.3
4000	69%	-1.6	5.4
4100	66%	-1.8	5.0
4200	65%	-1.9	4.7



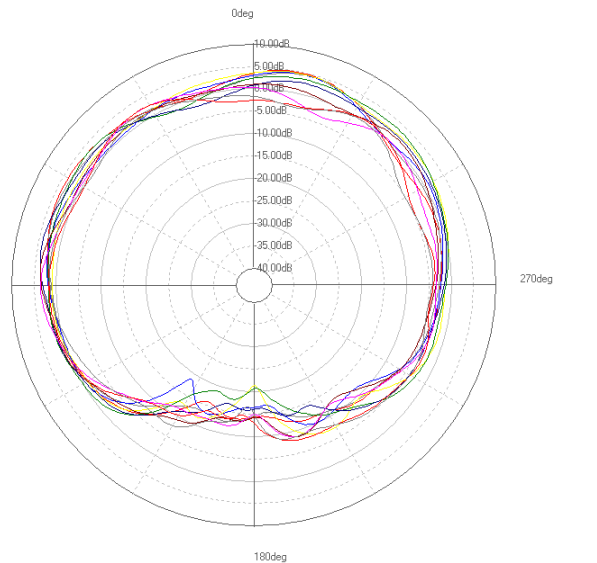
XY-plane



YZ-plane



ZX-plane

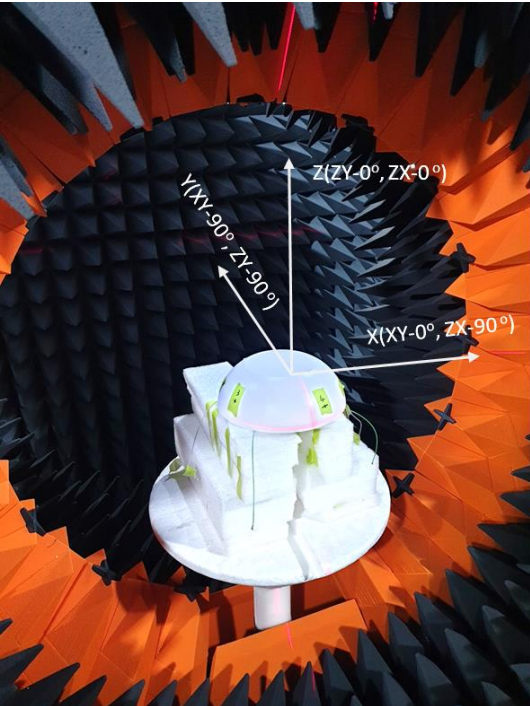


Pattern ANT-1 (5G FR1)

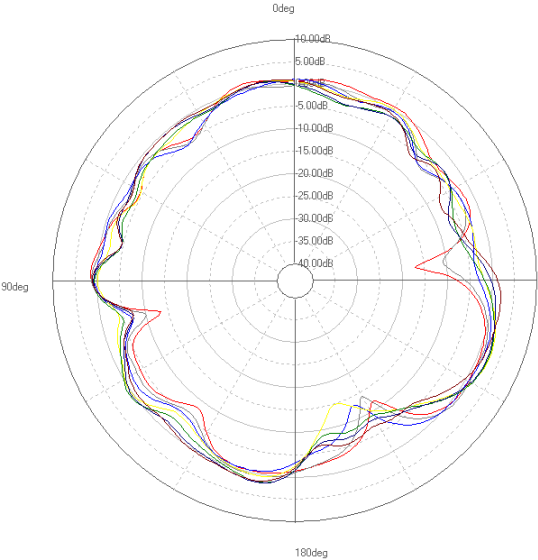
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
4400	65%	-1.9	5.4
4500	65%	-1.8	5.7
4600	64%	-1.9	5.5
4700	65%	-1.9	4.6
4800	62%	-2.1	4.9
4900	65%	-1.9	5.0
5000	63%	-2.0	4.5

Legend

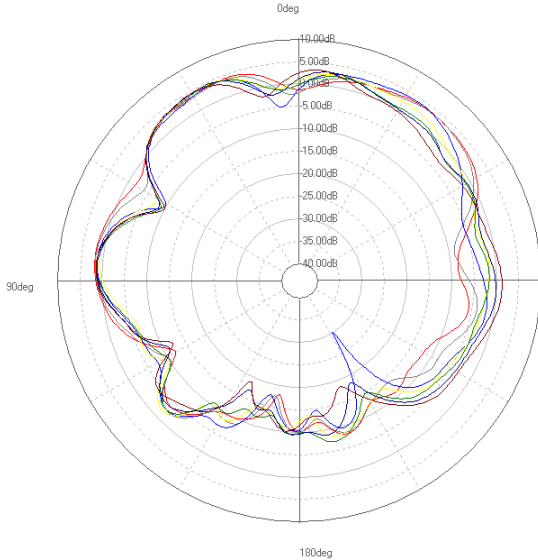
- 4400.00(MHz)
- 4500.00(MHz)
- 4600.00(MHz)
- 4700.00(MHz)
- 4800.00(MHz)
- 4900.00(MHz)
- 5000.00(MHz)



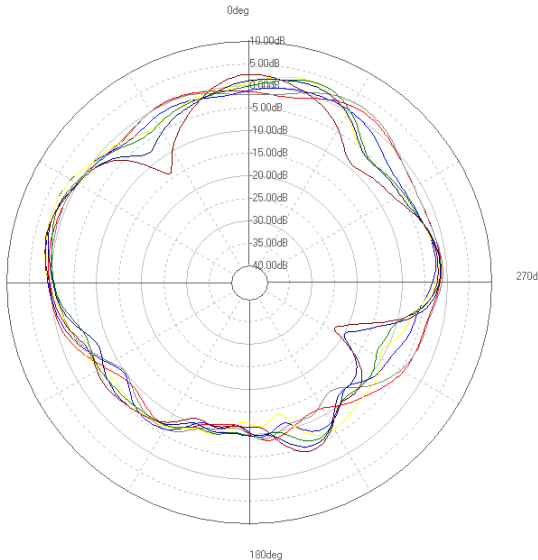
XY-plane



YZ-plane



ZX-plane

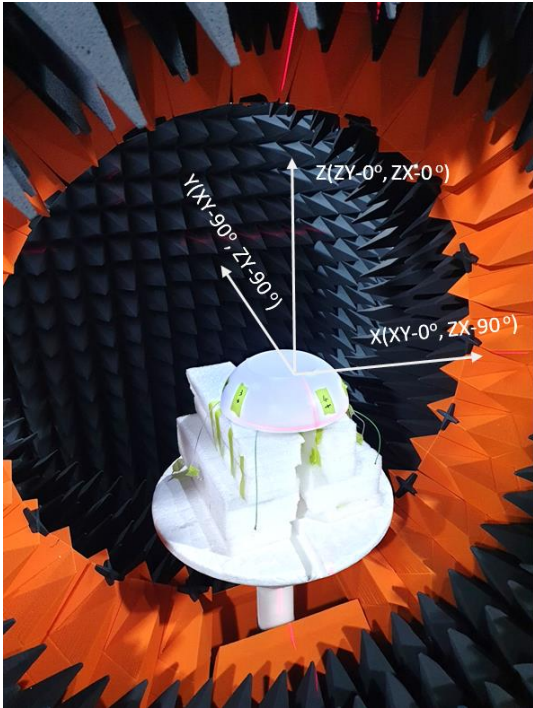


Pattern ANT-1 (5G FR1)

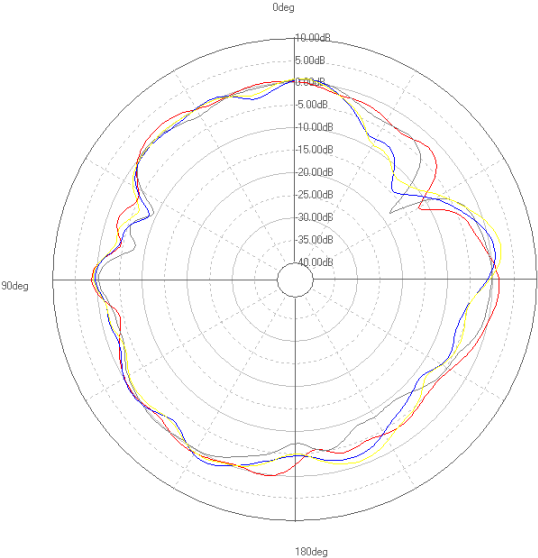
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
5150	61%	-2.2	4.2
5500	46%	-3.4	3.2
5850	48%	-3.2	2.9
5925	49%	-3.1	3.2

Legend

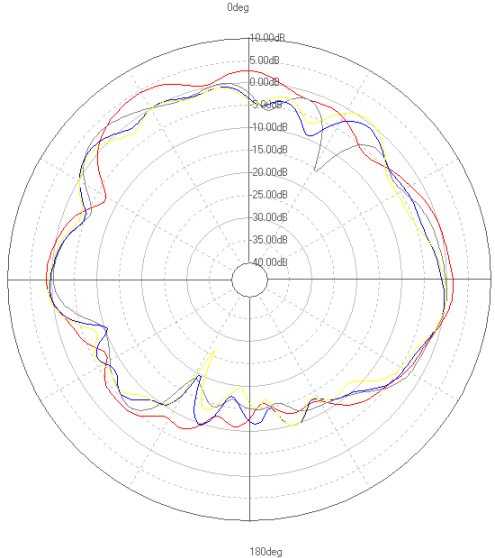
- 5150.00(MHz)
- 5500.00(MHz)
- 5850.00(MHz)
- 5925.00(MHz)



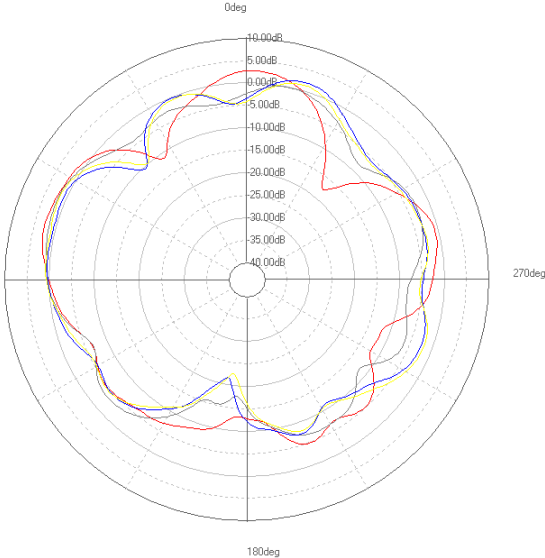
XY-plane



YZ-plane



ZX-plane

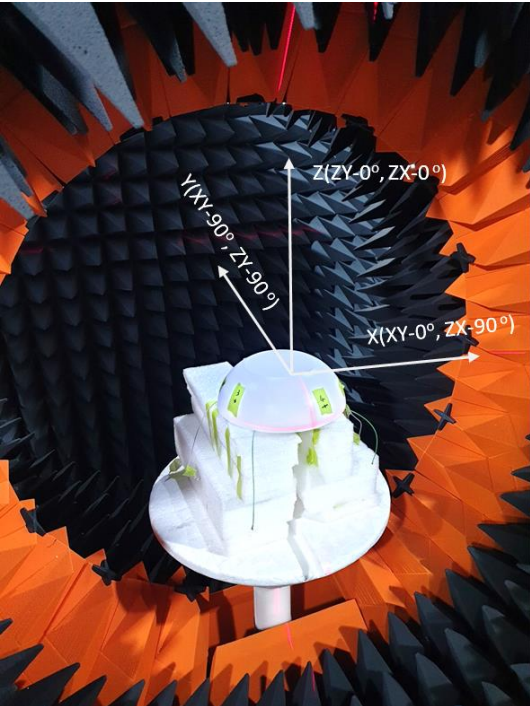


Pattern ANT-2 (5G FR1)

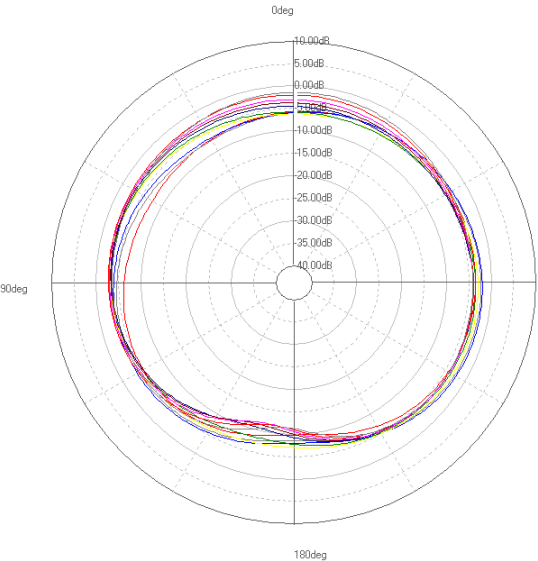
Legend

- 617.00(MHz)
- 652.00(MHz)
- 663.00(MHz)
- 698.00(MHz)
- 710.00(MHz)
- 734.00(MHz)
- 751.00(MHz)
- 768.00(MHz)
- 798.00(MHz)
- 824.00(MHz)
- 849.00(MHz)
- 869.00(MHz)
- 894.00(MHz)
- 900.00(MHz)
- 925.00(MHz)
- 960.00(MHz)

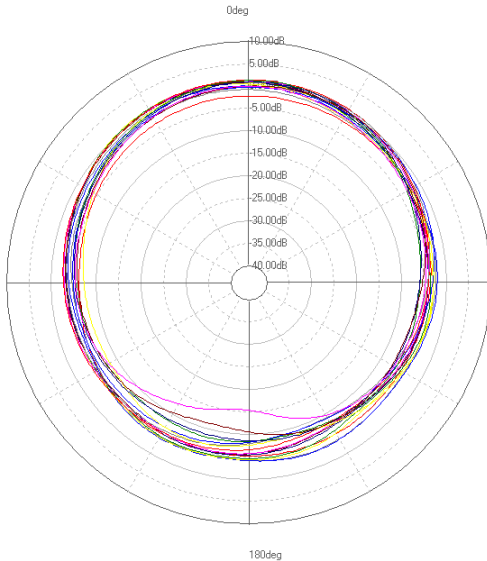
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
617	34%	-4.7	-1.7
652	38%	-4.2	-0.9
663	42%	-3.8	-0.1
698	44%	-3.5	0.8
710	44%	-3.6	0.8
734	44%	-3.6	0.7
751	45%	-3.5	0.8
768	48%	-3.2	1.2
798	50%	-3.0	1.6
824	48%	-3.2	1.2
849	45%	-3.4	0.1
869	43%	-3.7	0.6
894	40%	-4.0	1.6
900	40%	-4.0	1.5
925	37%	-4.3	0.9
960	32%	-4.9	0.5



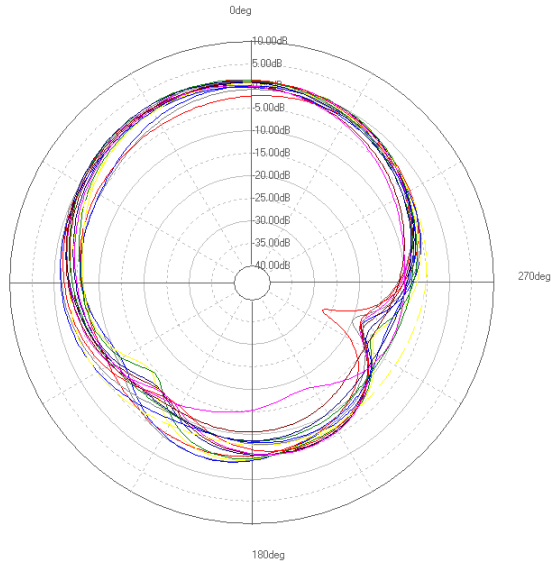
XY-plane



YZ-plane



ZX-plane

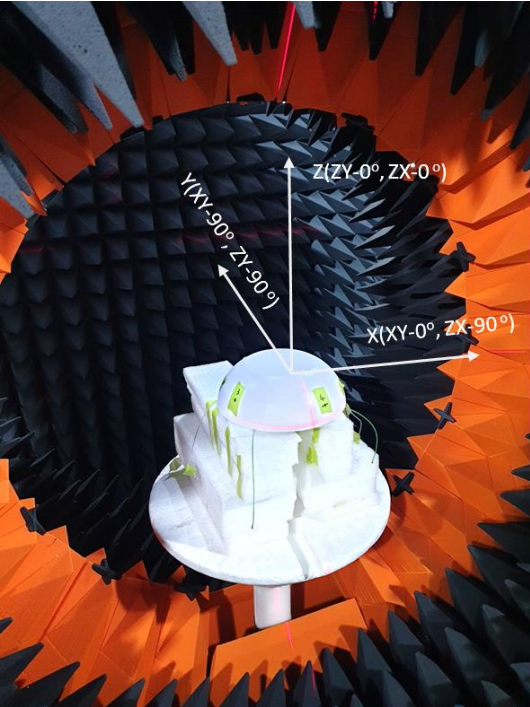


Pattern ANT-2 (5G FR1)

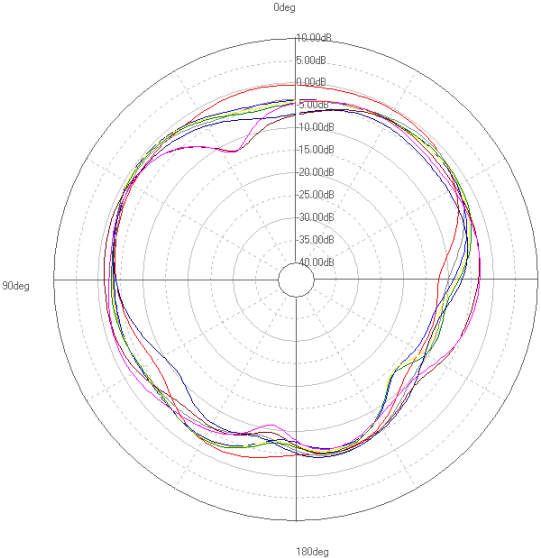
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
1710	74%	-1.3	2.4
1805	63%	-2.0	3.05
1880	66%	-1.8	3.02
1900	66%	-1.8	3.05
1920	67%	-1.7	3.04
2110	51%	-2.9	4.0
2170	62%	-2.1	4.4
2200	64%	-2.0	4.3

Legend

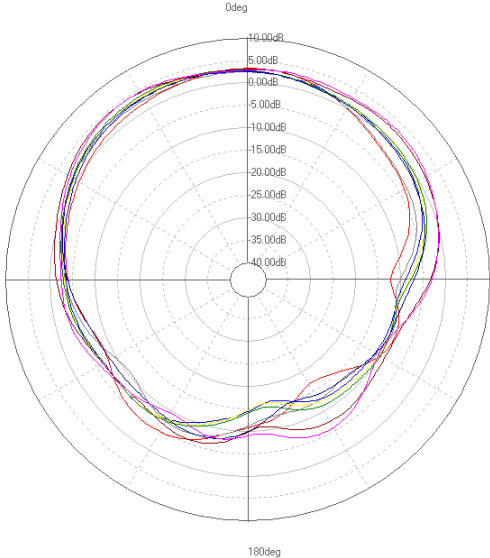
- 1710.00(MHz)
- 1805.00(MHz)
- 1880.00(MHz)
- 1900.00(MHz)
- 1920.00(MHz)
- 2110.00(MHz)
- 2170.00(MHz)
- 2200.00(MHz)



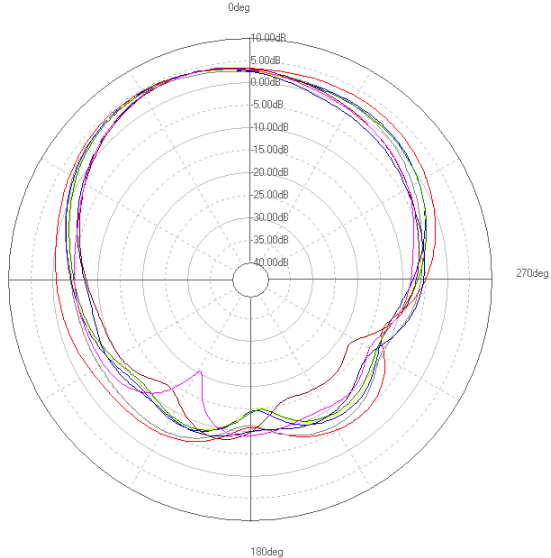
XY-plane



YZ-plane



ZX-plane

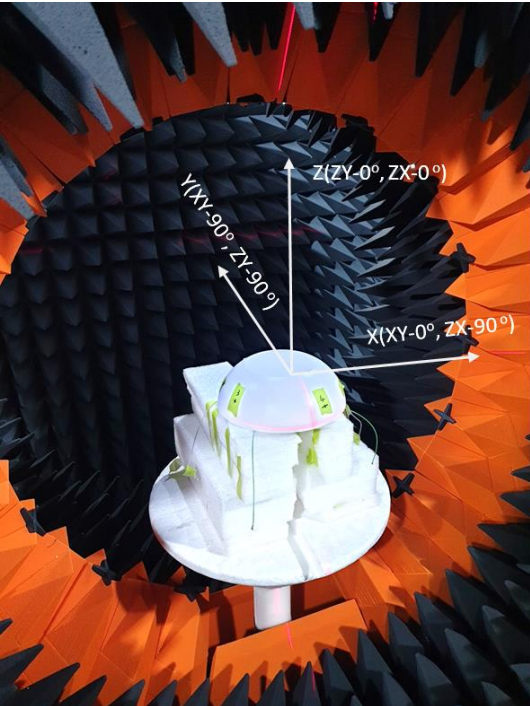


Pattern ANT-2 (5G FR1)

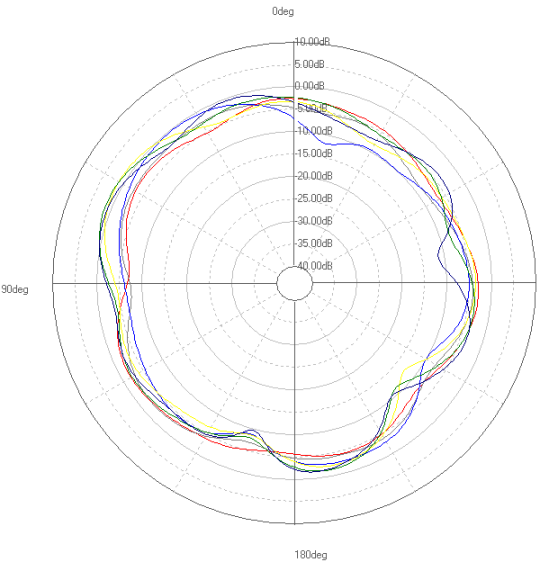
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
2300	64%	-1.9	-2.1
2350	59%	-2.3	-2.2
2400	53%	-2.7	3.12
2500	59%	-2.3	3.09
2595	68%	-1.7	3.12
2690	65%	-1.9	3.10

Legend

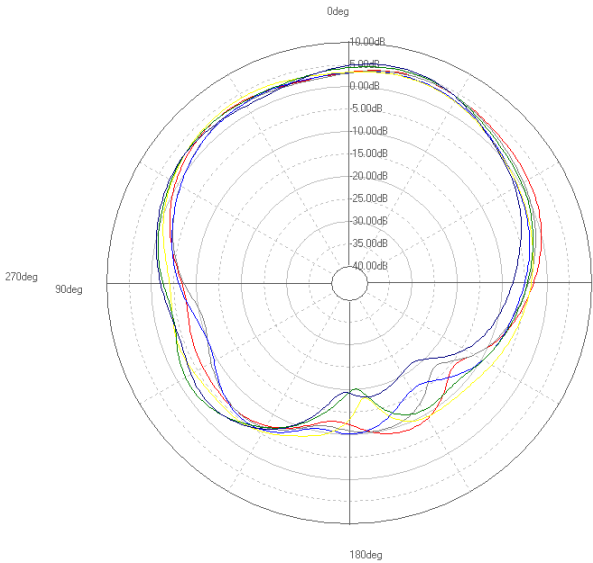
- 2300.00(MHz)
- 2350.00(MHz)
- 2400.00(MHz)
- 2500.00(MHz)
- 2595.00(MHz)
- 2690.00(MHz)



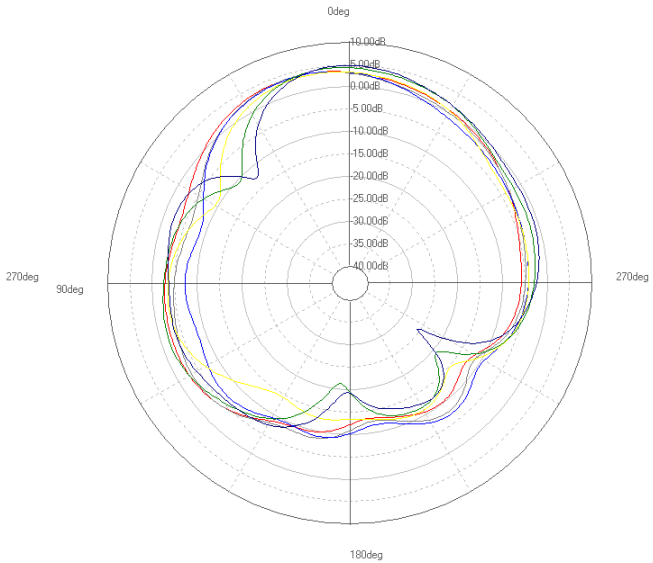
XY-plane



YZ-plane



ZX-plane

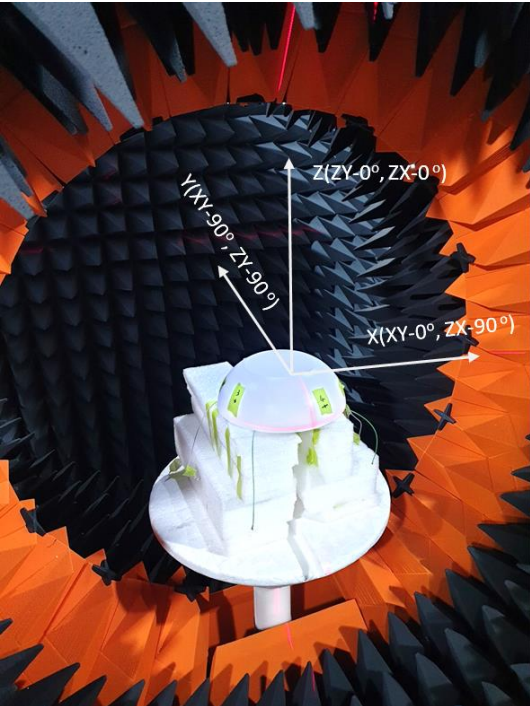


Pattern ANT-2 (5G FR1)

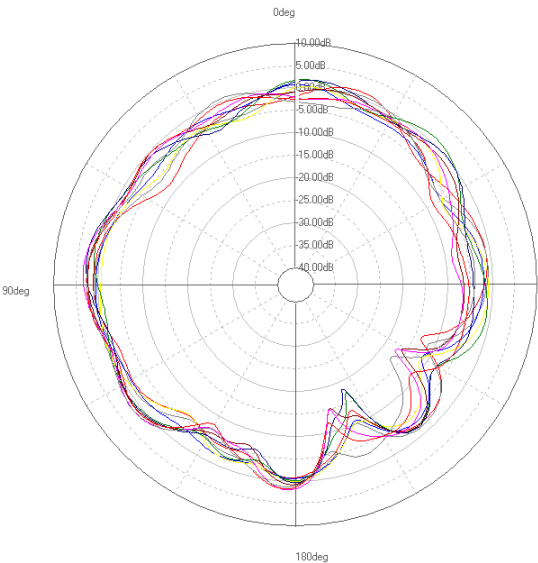
Legend

- 3300.00(MHz)
- 3400.00(MHz)
- 3500.00(MHz)
- 3600.00(MHz)
- 3700.00(MHz)
- 3800.00(MHz)
- 3900.00(MHz)
- 4000.00(MHz)
- 4100.00(MHz)
- 4200.00(MHz)

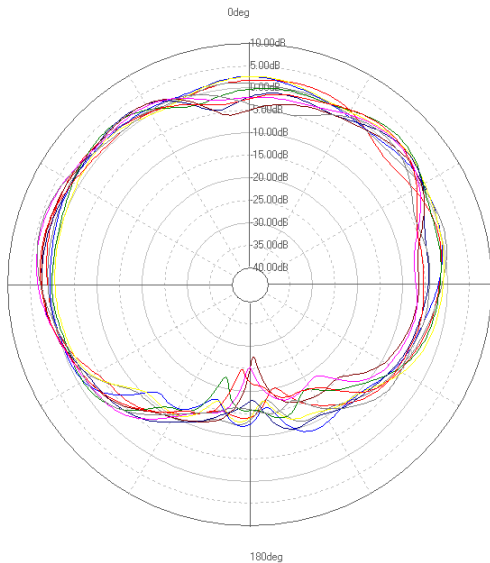
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
3300	67%	-1.8	5.4
3400	66%	-1.8	4.8
3500	63%	-2.0	-2.1
3600	62%	-2.1	-2.1
3700	68%	-1.7	-2.1
3800	67%	-1.7	4.3
3900	62%	-2.1	3.5
4000	66%	-1.8	4.1
4100	63%	-2.0	4.6
4200	62%	-2.1	4.5



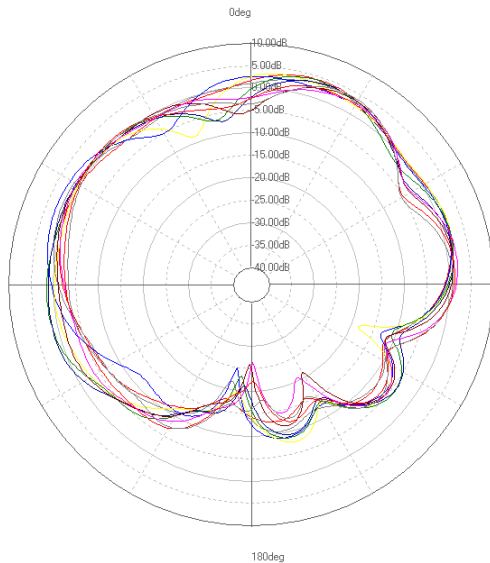
XY-plane



YZ-plane



ZX-plane

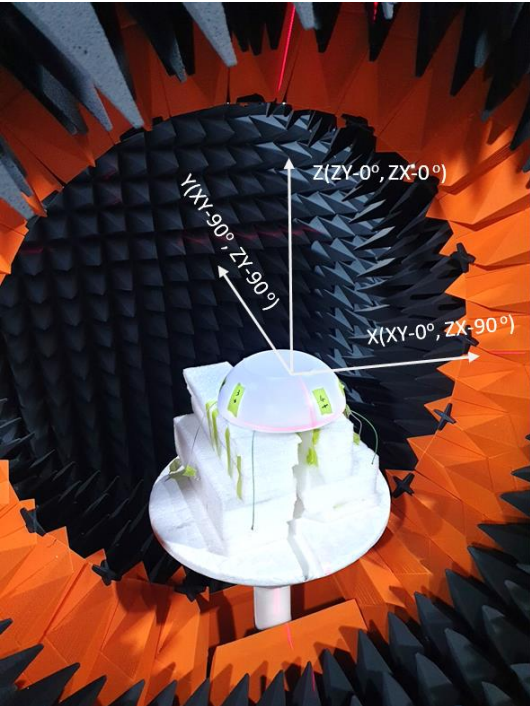


Pattern ANT-2 (5G FR1)

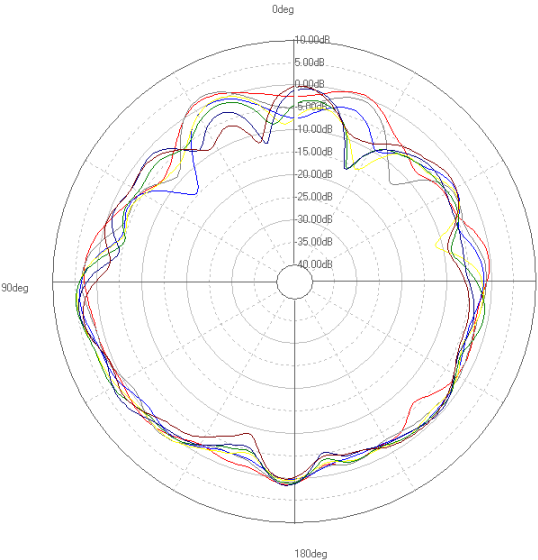
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
4400	64%	-1.9	4.5
4500	62%	-2.1	4.4
4600	57%	-2.4	4.4
4700	58%	-2.4	5.1
4800	61%	-2.1	5.4
4900	59%	-2.3	5.4
5000	54%	-2.7	5.3

Legend

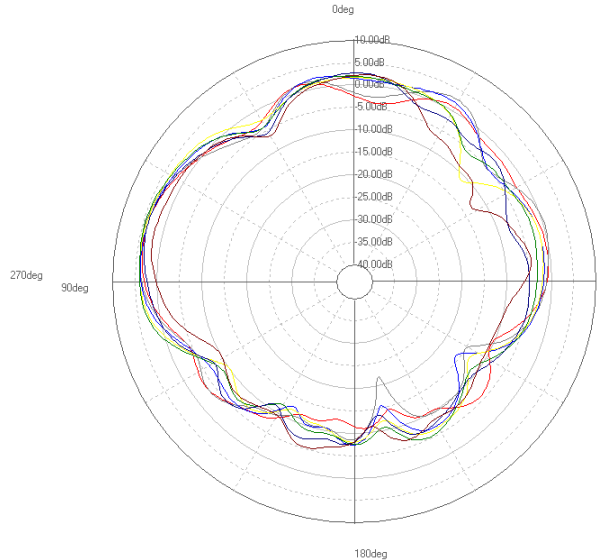
- 4400.00(MHz)
- 4500.00(MHz)
- 4600.00(MHz)
- 4700.00(MHz)
- 4800.00(MHz)
- 4900.00(MHz)
- 5000.00(MHz)



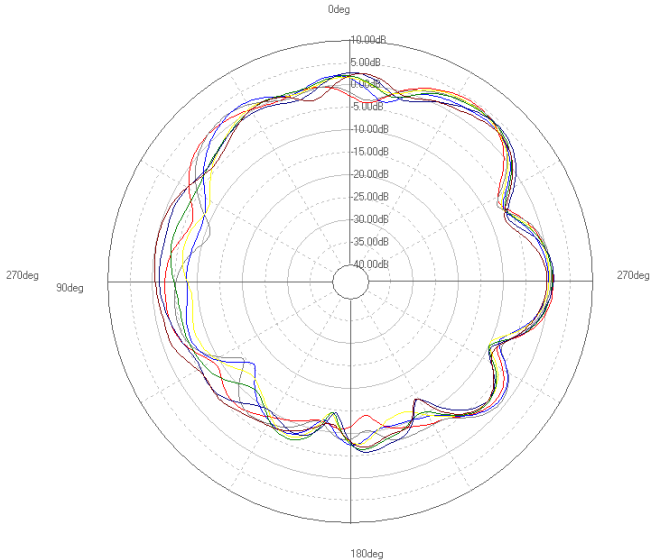
XY-plane



YZ-plane



ZX-plane

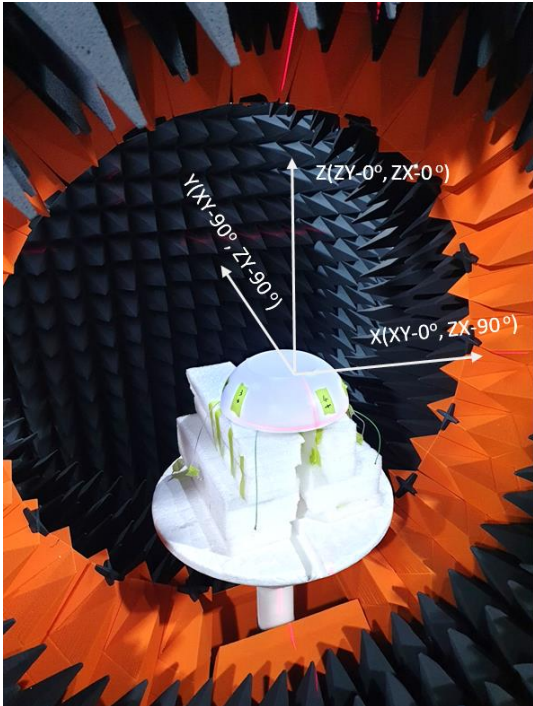


Pattern ANT-2 (5G FR1)

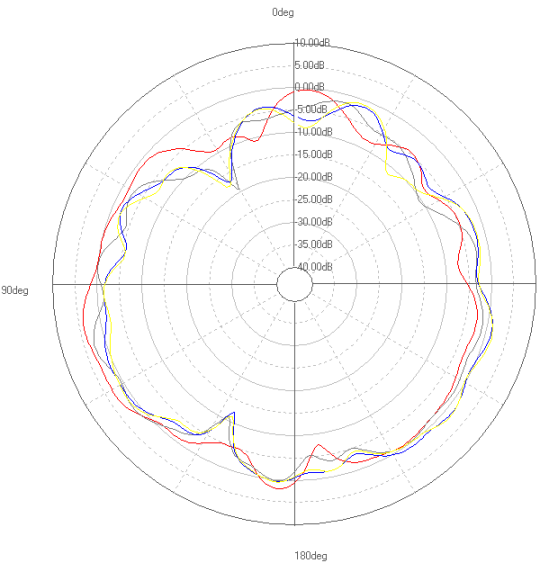
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
5150	58%	-2.3	5.2
5500	50%	-3.0	4.2
5850	52%	-2.9	4.0
5925	50%	-3.0	4.3

Legend

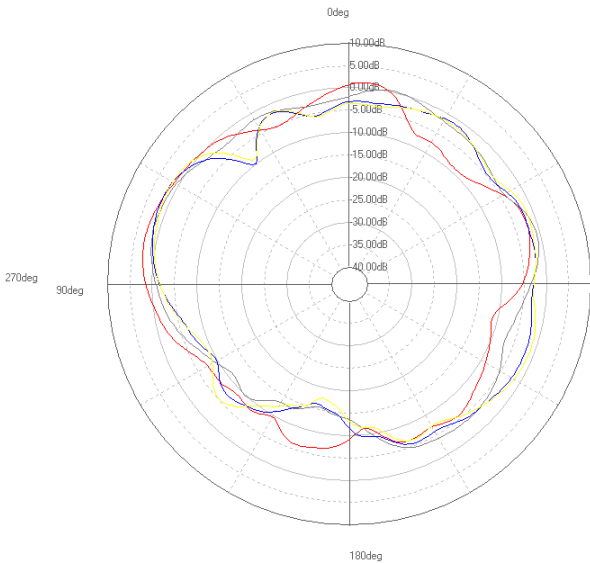
- 5150.00(MHz)
- 5500.00(MHz)
- 5850.00(MHz)
- 5925.00(MHz)



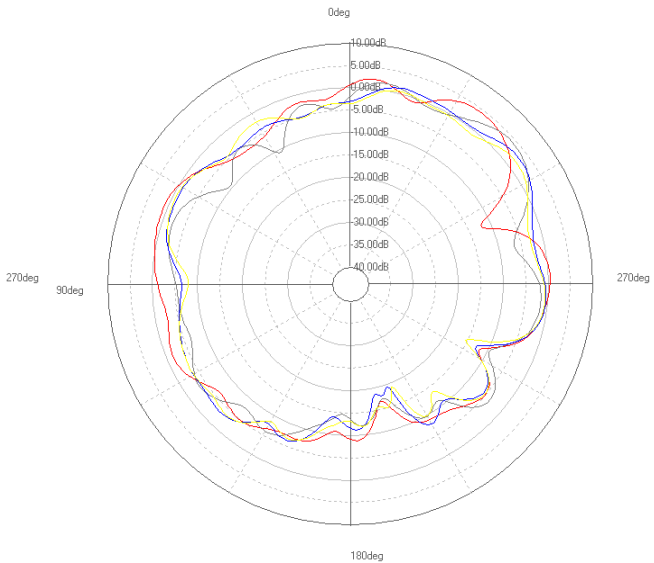
XY-plane



YZ-plane



ZX-plane

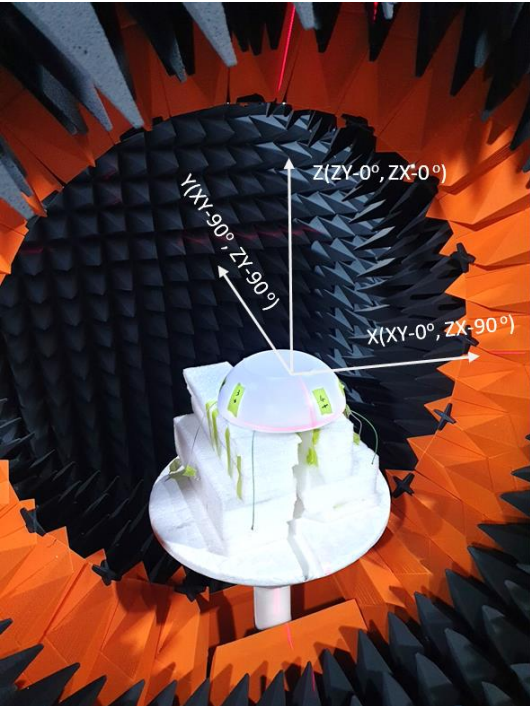


Pattern ANT-3 (5G FR1)

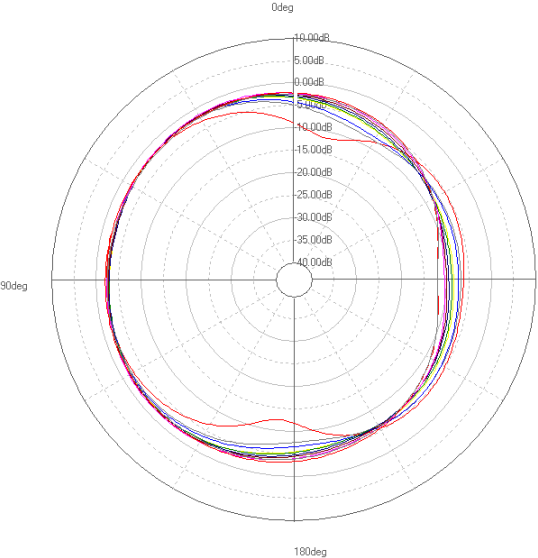
Legend

- 617.00(MHz)
- 652.00(MHz)
- 663.00(MHz)
- 698.00(MHz)
- 710.00(MHz)
- 734.00(MHz)
- 751.00(MHz)
- 768.00(MHz)
- 798.00(MHz)
- 824.00(MHz)
- 849.00(MHz)
- 869.00(MHz)
- 894.00(MHz)
- 900.00(MHz)
- 925.00(MHz)
- 960.00(MHz)

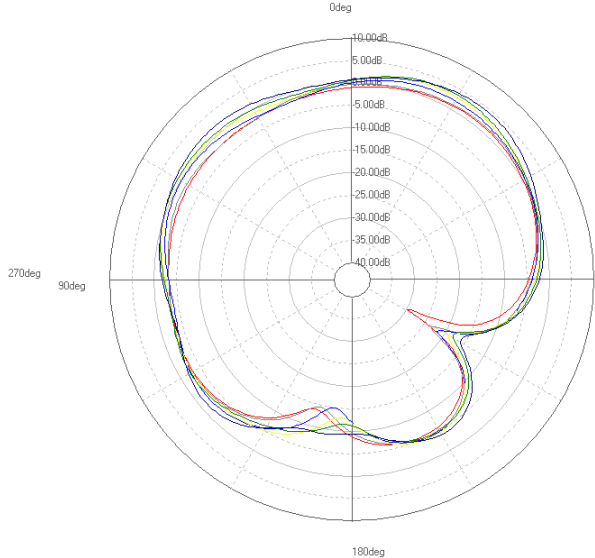
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
617	31%	-5.1	-2.0
652	37%	-4.3	-0.7
663	41%	-3.9	-0.3
698	45%	-3.4	0.4
710	46%	-3.4	0.6
734	46%	-3.3	0.7
751	48%	-3.2	0.9
768	51%	-3.0	1.3
798	52%	-2.8	1.6
824	49%	-3.1	1.3
849	46%	-3.4	1.1
869	43%	-3.7	0.9
894	40%	-4.0	0.6
900	40%	-4.0	0.7
925	38%	-4.2	1.1
960	35%	-4.6	1.1



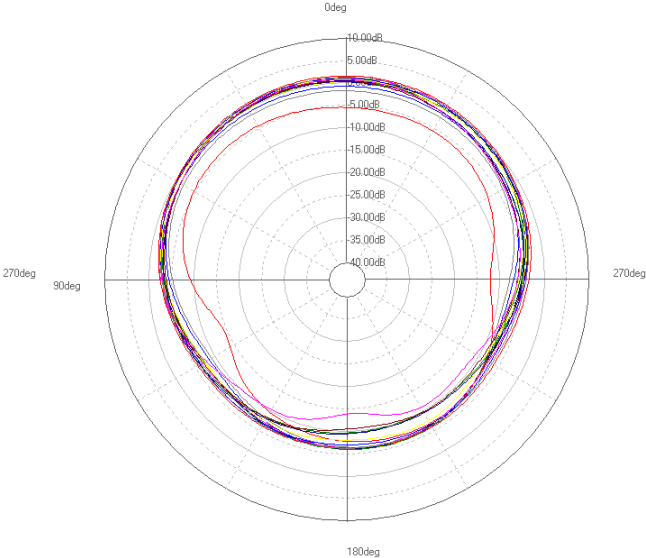
XY-plane



YZ-plane



ZX-plane

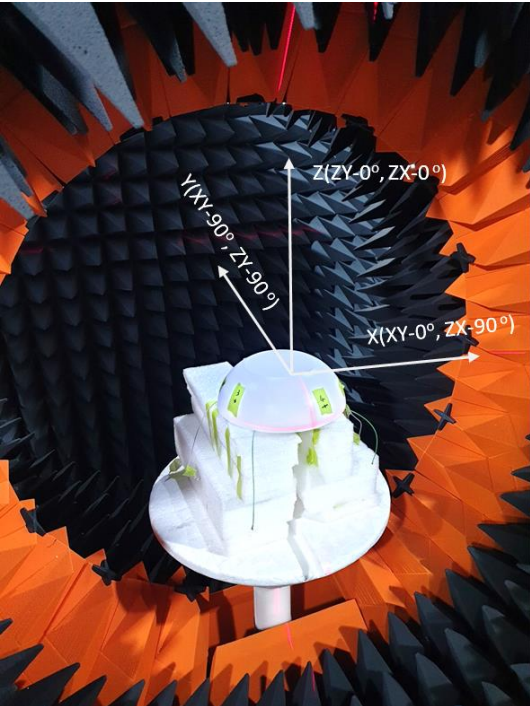


Pattern ANT-3 (5G FR1)

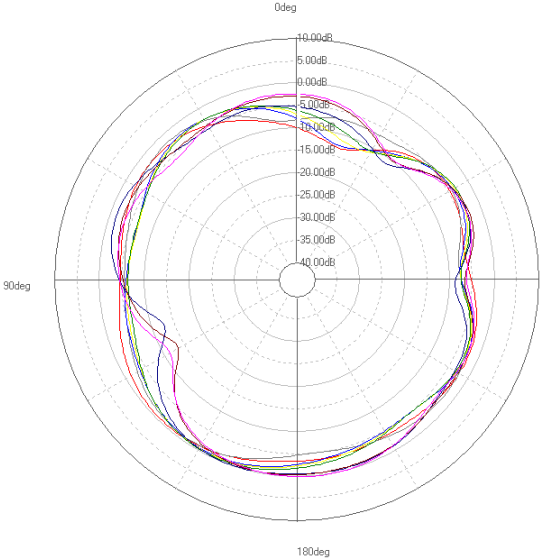
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
1710	70%	-1.5	2.4
1805	60%	-2.2	3.05
1880	66%	-1.8	3.01
1900	65%	-1.8	3.05
1920	66%	-1.8	3.03
2110	69%	-1.6	5.0
2170	68%	-1.7	5.0
2200	69%	-1.6	5.2

Legend

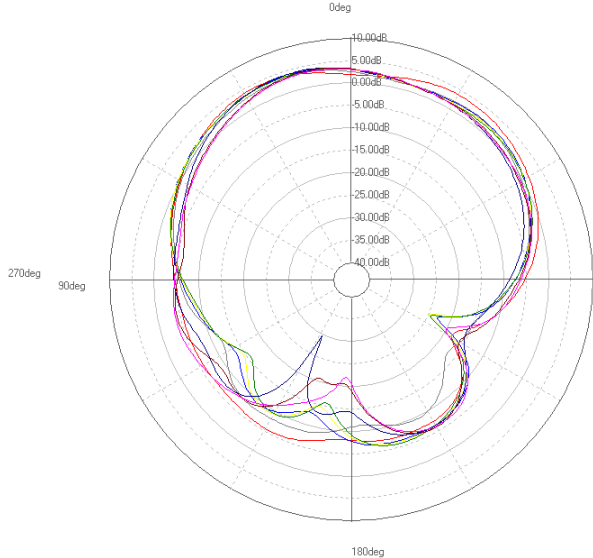
- 1710.00(MHz)
- 1805.00(MHz)
- 1880.00(MHz)
- 1900.00(MHz)
- 1920.00(MHz)
- 2110.00(MHz)
- 2170.00(MHz)
- 2200.00(MHz)



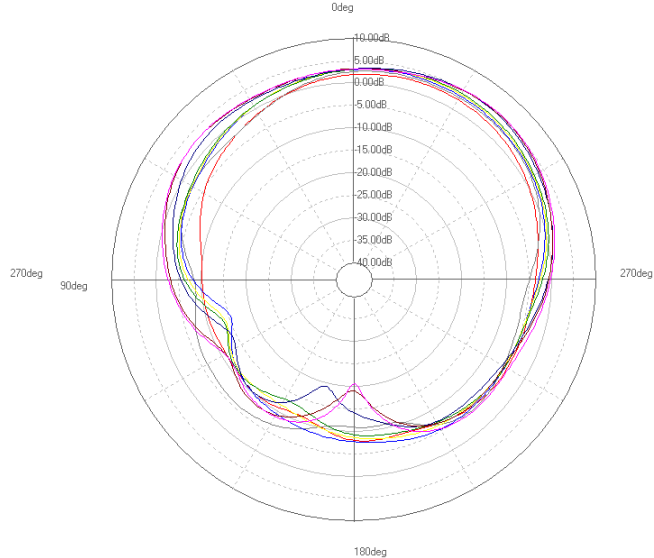
XY-plane



YZ-plane



ZX-plane

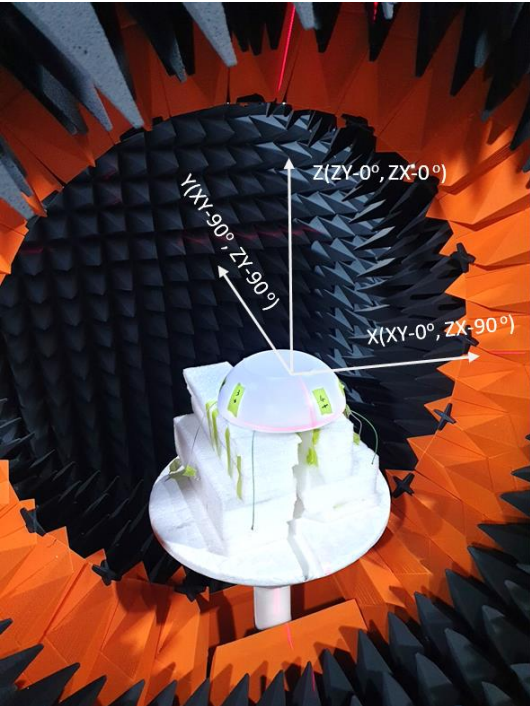


Pattern ANT-3 (5G FR1)

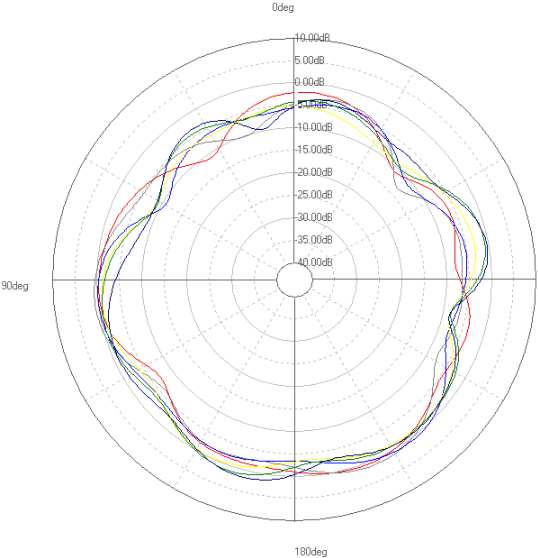
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
2300	69%	-1.6	-2.1
2350	67%	-1.8	-2.2
2400	62%	-2.1	3.12
2500	60%	-2.2	3.10
2595	66%	-1.8	3.12
2690	66%	-1.8	3.09

Legend

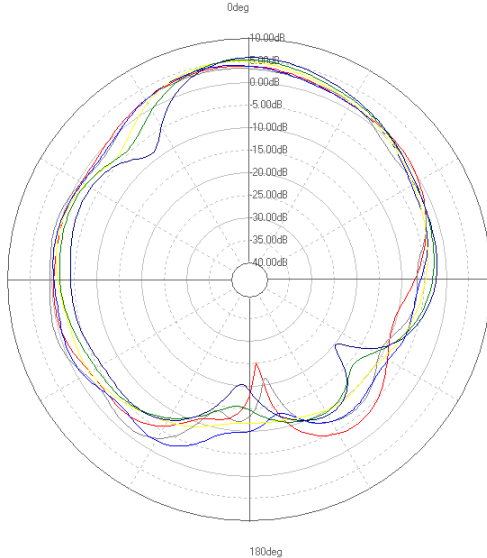
- 2300.00(MHz)
- 2350.00(MHz)
- 2400.00(MHz)
- 2500.00(MHz)
- 2595.00(MHz)
- 2690.00(MHz)



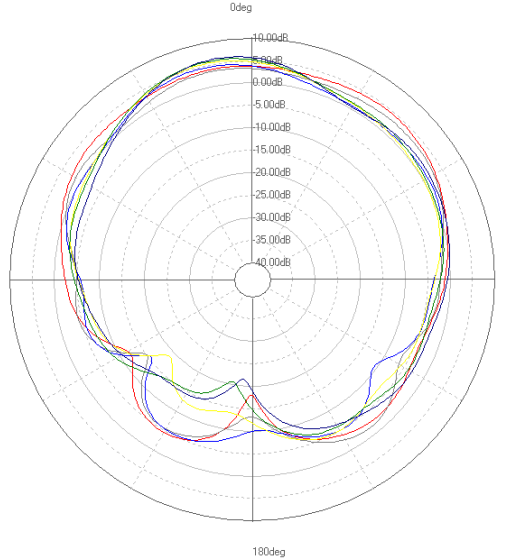
XY-plane



YZ-plane



ZX-plane

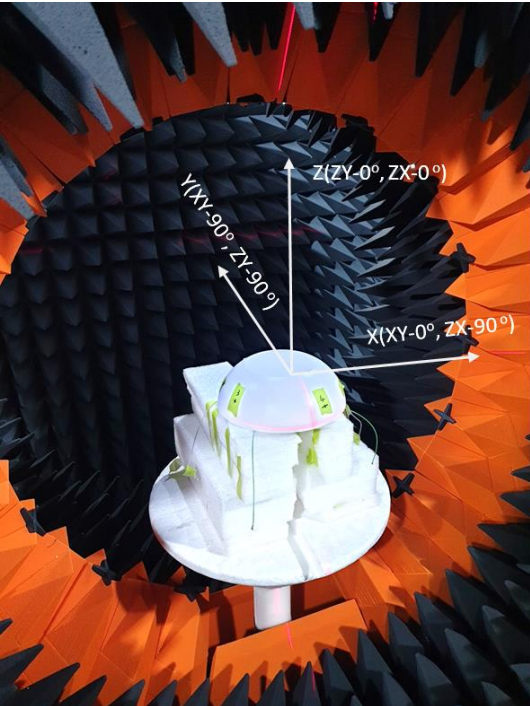


Pattern ANT-3 (5G FR1)

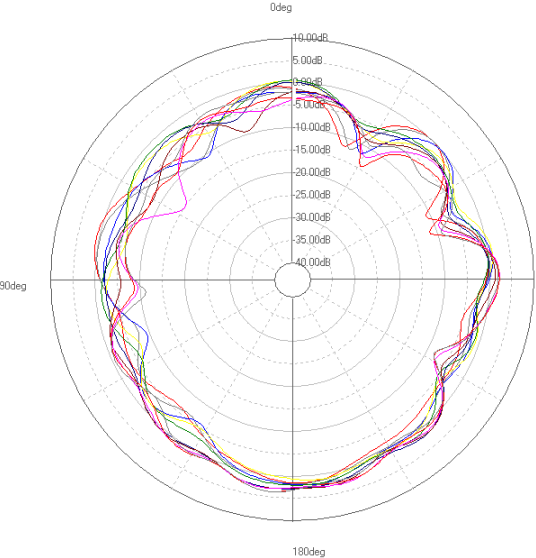
Legend

- 3300.00(MHz)
- 3400.00(MHz)
- 3500.00(MHz)
- 3600.00(MHz)
- 3700.00(MHz)
- 3800.00(MHz)
- 3900.00(MHz)
- 4000.00(MHz)
- 4100.00(MHz)
- 4200.00(MHz)

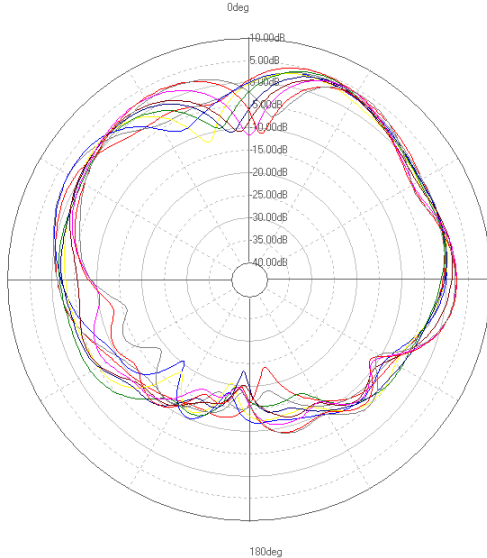
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
3300	66%	-1.8	5.5
3400	66%	-1.8	5.2
3500	64%	-1.9	-2.1
3600	64%	-2.0	-2.1
3700	69%	-1.6	-2.1
3800	69%	-1.6	5.5
3900	65%	-1.8	5.5
4000	67%	-1.8	5.5
4100	65%	-1.9	4.7
4200	64%	-1.9	4.8



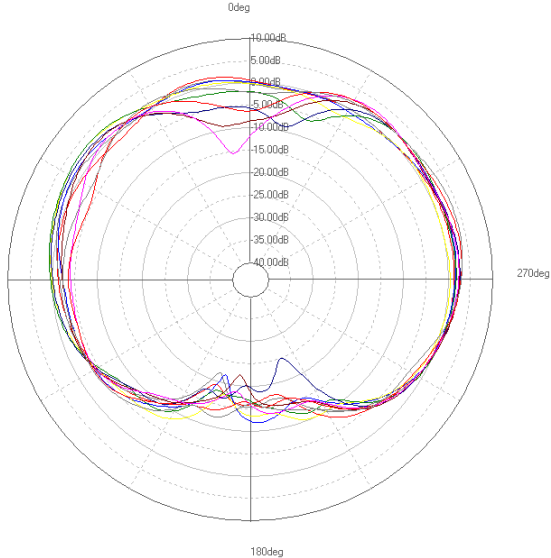
XY-plane



YZ-plane



ZX-plane

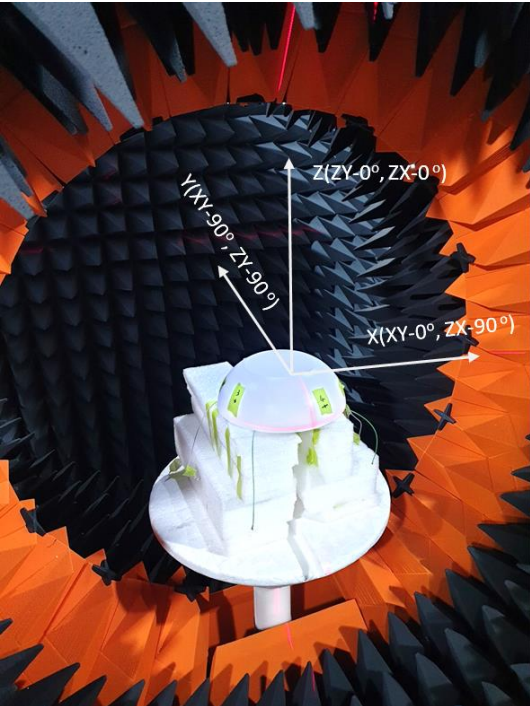


Pattern ANT-3 (5G FR1)

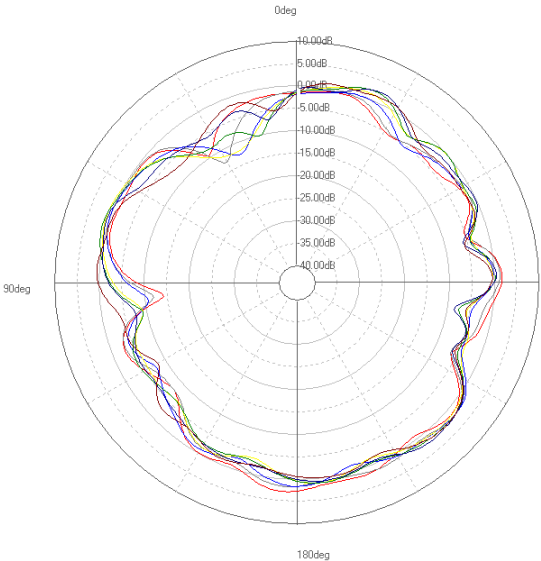
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
4400	64%	-1.9	4.8
4500	63%	-2.0	4.4
4600	60%	-2.2	4.1
4700	61%	-2.2	4.1
4800	62%	-2.1	4.3
4900	62%	-2.1	4.0
5000	60%	-2.2	4.1

Legend

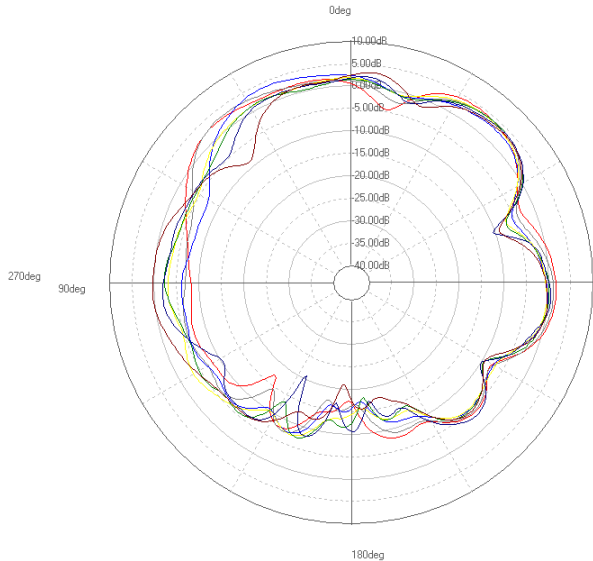
- 4400.00(MHz)
- 4500.00(MHz)
- 4600.00(MHz)
- 4700.00(MHz)
- 4800.00(MHz)
- 4900.00(MHz)
- 5000.00(MHz)



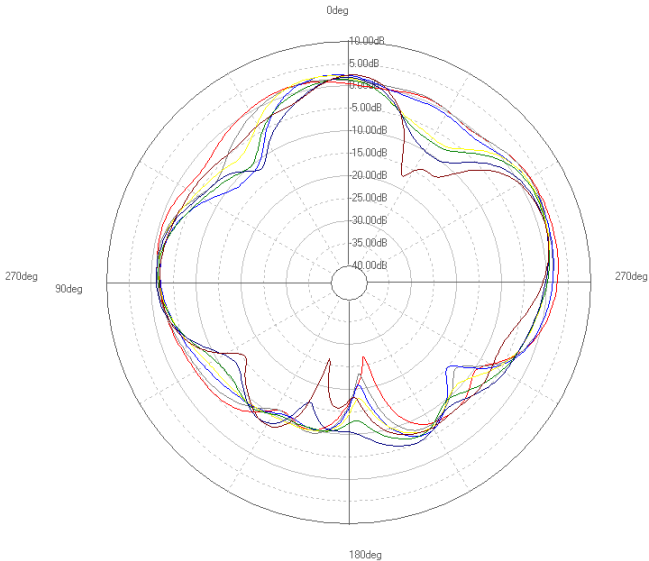
XY-plane



YZ-plane



ZX-plane

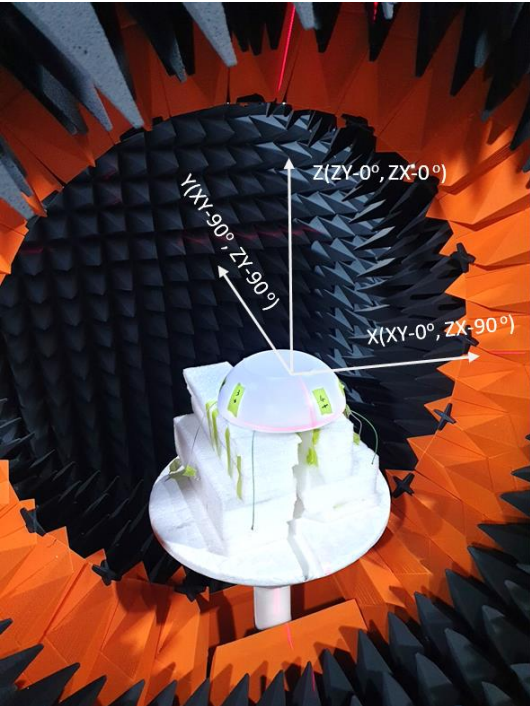


Pattern ANT-3 (5G FR1)

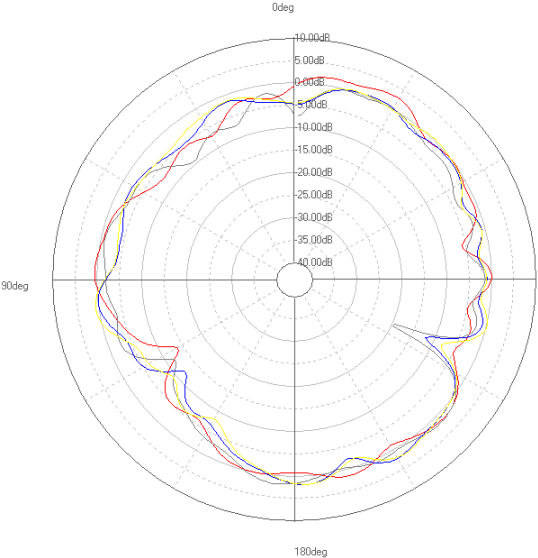
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
5150	60%	-2.2	4.5
5500	49%	-3.1	4.4
5850	49%	-3.1	4.3
5925	50%	-3.0	4.1

Legend

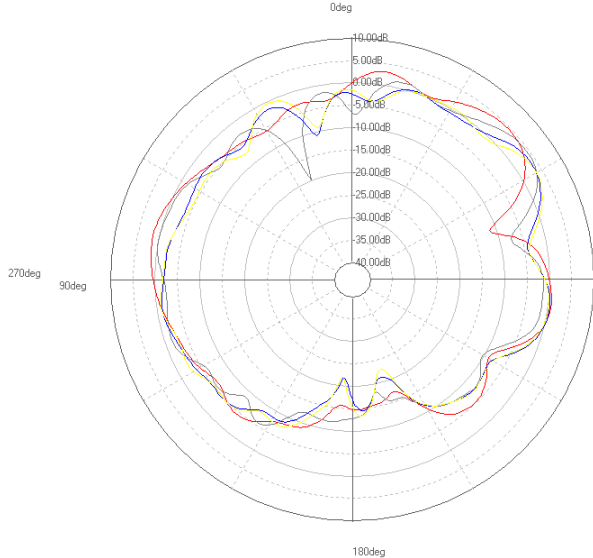
- 5150.00(MHz)
- 5500.00(MHz)
- 5850.00(MHz)
- 5925.00(MHz)



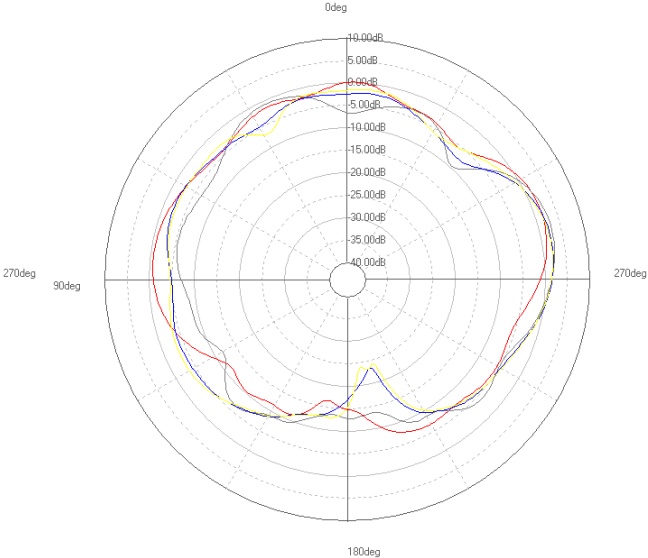
XY-plane



YZ-plane



ZX-plane

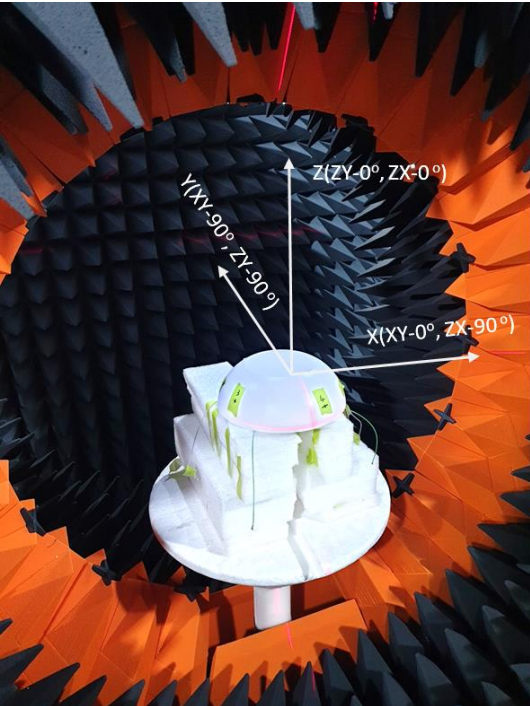


Pattern ANT-4 (5G FR1)

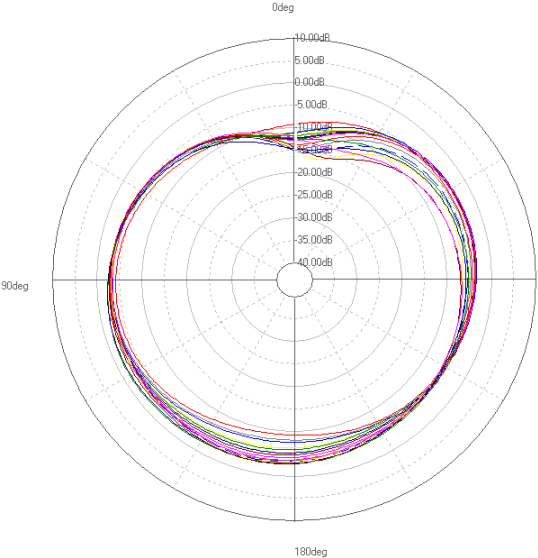
Legend

- 617.00(MHz)
- 652.00(MHz)
- 663.00(MHz)
- 698.00(MHz)
- 710.00(MHz)
- 734.00(MHz)
- 751.00(MHz)
- 768.00(MHz)
- 798.00(MHz)
- 824.00(MHz)
- 849.00(MHz)
- 869.00(MHz)
- 894.00(MHz)
- 900.00(MHz)
- 925.00(MHz)
- 960.00(MHz)

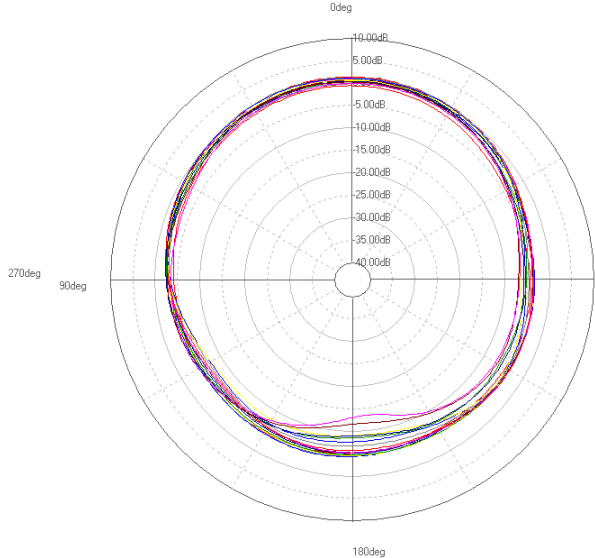
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
617	35%	-4.6	-0.7
652	39%	-4.1	-0.2
663	42%	-3.8	0.3
698	43%	-3.7	0.6
710	43%	-3.7	0.6
734	44%	-3.6	0.8
751	45%	-3.5	1.0
768	48%	-3.2	1.3
798	49%	-3.1	1.8
824	47%	-3.3	1.7
849	45%	-3.4	1.6
869	43%	-3.6	1.4
894	41%	-3.9	1.0
900	41%	-3.9	1.3
925	38%	-4.2	1.1
960	35%	-4.6	0.5



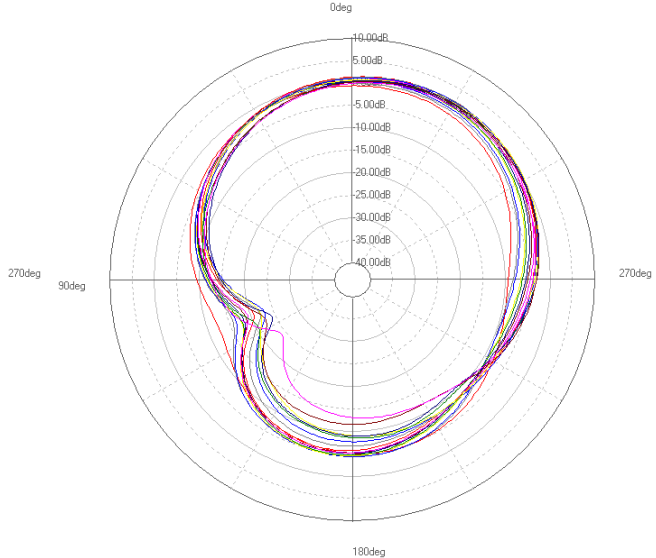
XY-plane



YZ-plane



ZX-plane

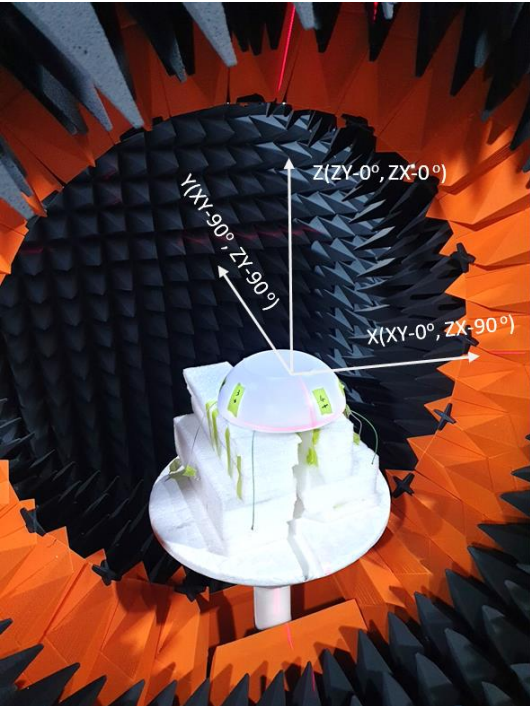


Pattern ANT-4 (5G FR1)

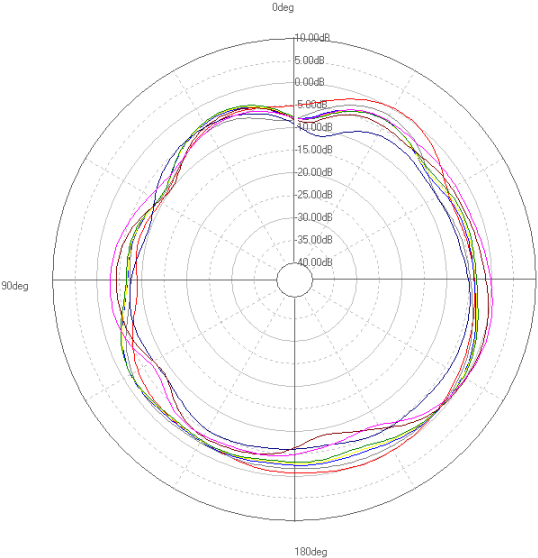
Legend

- 1710.00(MHz)
- 1805.00(MHz)
- 1880.00(MHz)
- 1900.00(MHz)
- 1920.00(MHz)
- 2110.00(MHz)
- 2170.00(MHz)
- 2200.00(MHz)

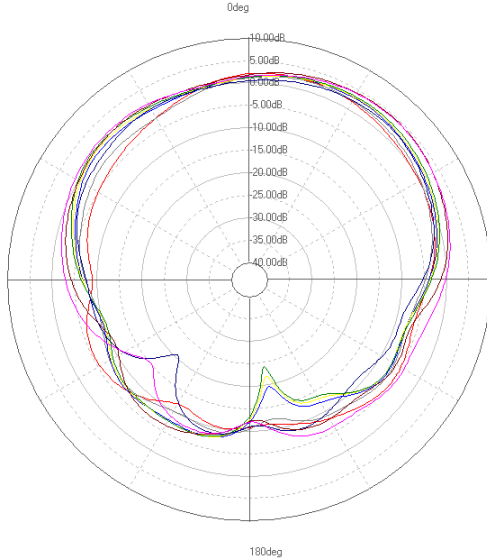
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
1710	73%	-1.4	2.4
1805	63%	-2.0	3.01
1880	64%	-2.0	3.05
1900	63%	-2.0	3.03
1920	63%	-2.0	3.05
2110	42%	-3.8	3.1
2170	57%	-2.5	4.4
2200	58%	-2.4	4.2



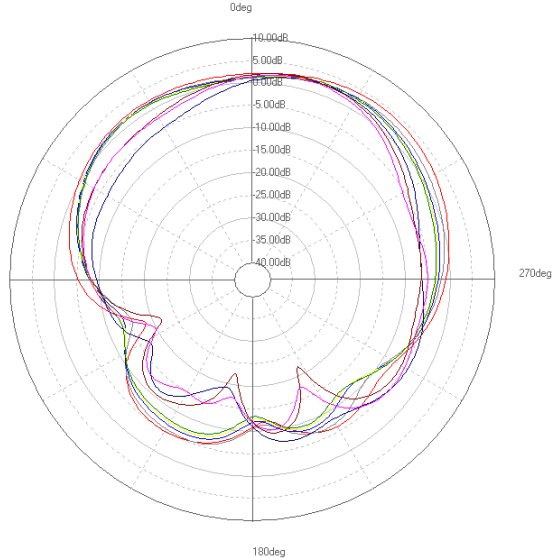
XY-plane



YZ-plane



ZX-plane

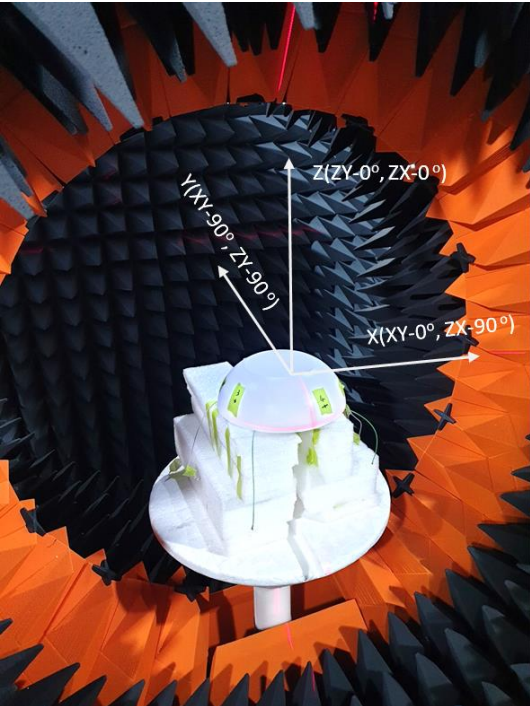


Pattern ANT-4 (5G FR1)

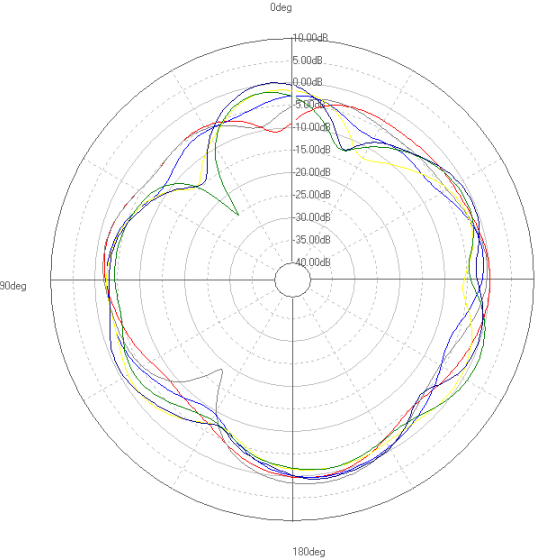
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
2300	57%	-2.4	-2.1
2350	56%	-2.5	-2.2
2400	51%	-2.9	3.0
2500	61%	-2.1	3.12
2595	67%	-1.8	3.09
2690	66%	-1.8	3.12

Legend

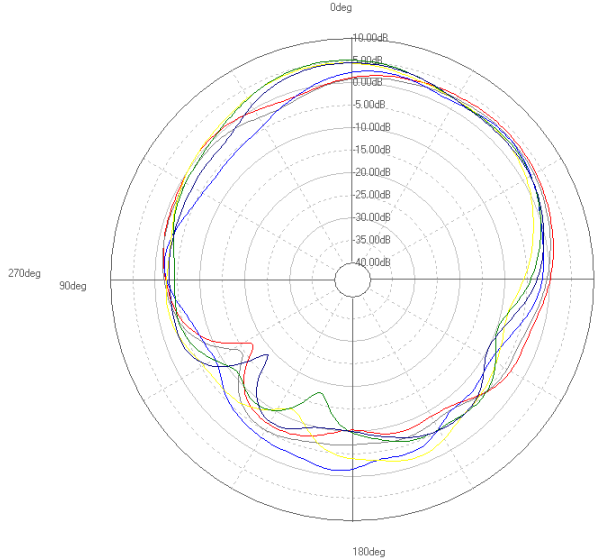
- 2300.00(MHz)
- 2350.00(MHz)
- 2400.00(MHz)
- 2500.00(MHz)
- 2595.00(MHz)
- 2690.00(MHz)



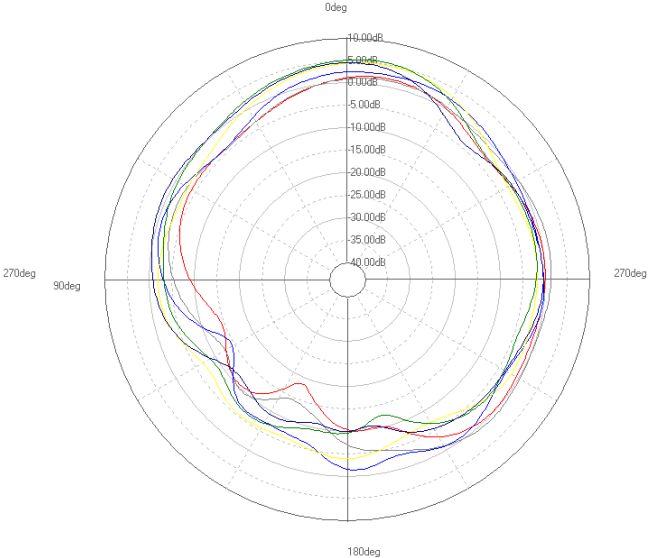
XY-plane



YZ-plane



ZX-plane

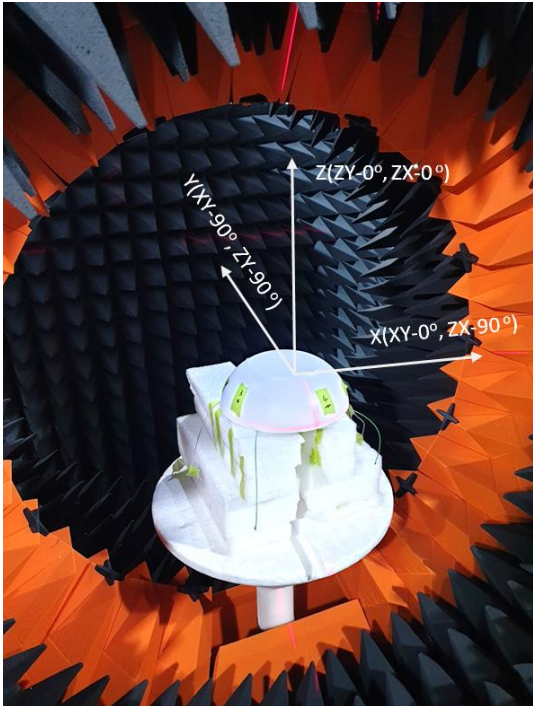


Pattern ANT-4 (5G FR1)

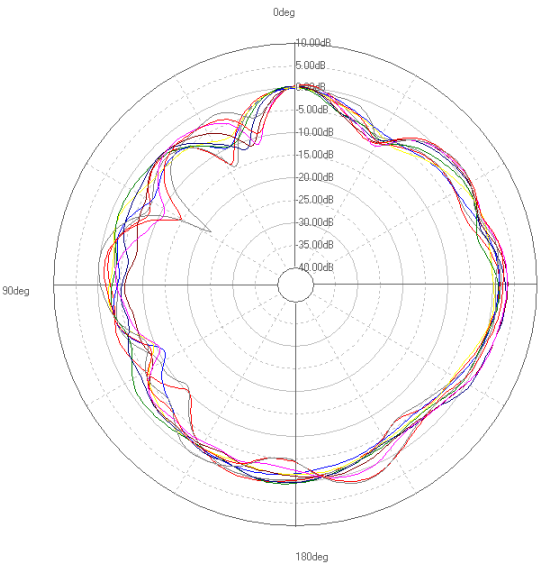
Legend

- 3300.00(MHz)
- 3400.00(MHz)
- 3500.00(MHz)
- 3600.00(MHz)
- 3700.00(MHz)
- 3800.00(MHz)
- 3900.00(MHz)
- 4000.00(MHz)
- 4100.00(MHz)
- 4200.00(MHz)

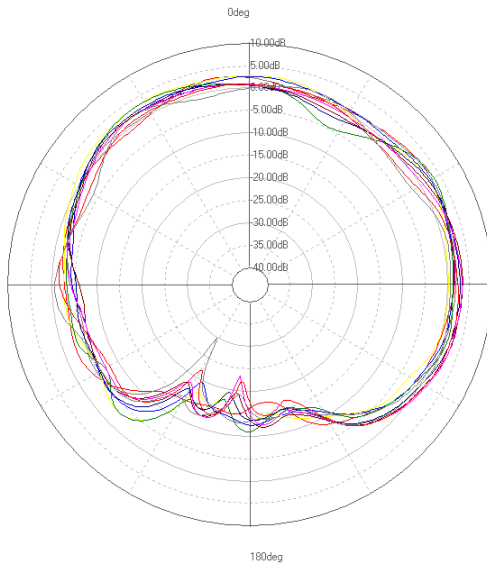
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
3300	67%	-1.8	4.5
3400	65%	-1.8	4.2
3500	64%	-2.0	-2.1
3600	64%	-2.0	-2.1
3700	67%	-1.7	-2.1
3800	67%	-1.7	4.3
3900	63%	-2.0	3.8
4000	65%	-1.8	4.4
4100	65%	-1.9	4.8
4200	65%	-1.9	5.1



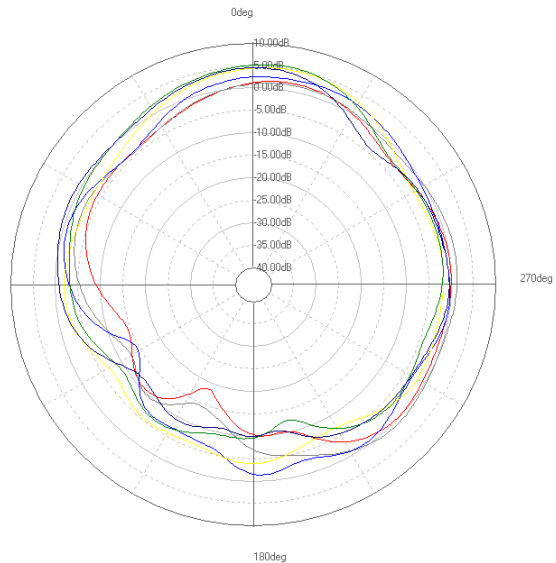
XY-plane



YZ-plane



ZX-plane

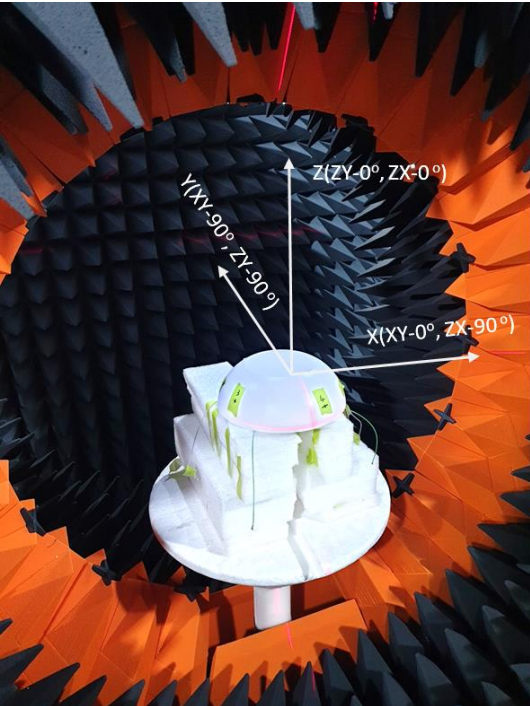


Pattern ANT-4 (5G FR1)

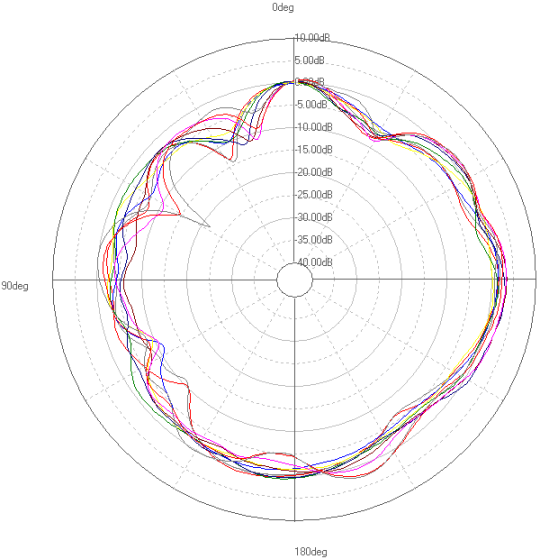
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
4400	64%	-2.0	5.7
4500	62%	-2.1	6.0
4600	58%	-2.4	5.8
4700	54%	-2.7	3.9
4800	55%	-2.6	4.1
4900	55%	-2.6	4.0
5000	53%	-2.7	4.0

Legend

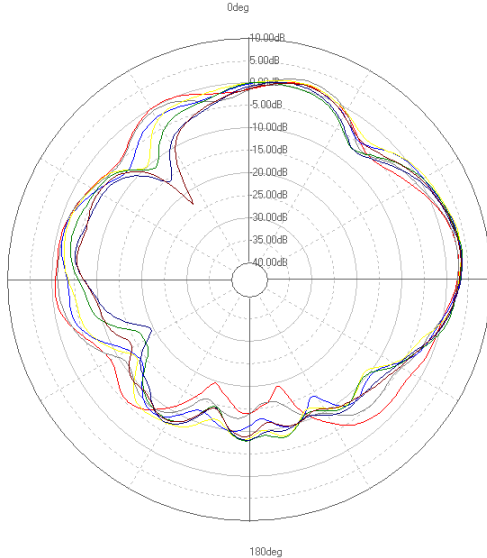
- 4400.00(MHz)
- 4500.00(MHz)
- 4600.00(MHz)
- 4700.00(MHz)
- 4800.00(MHz)
- 4900.00(MHz)
- 5000.00(MHz)



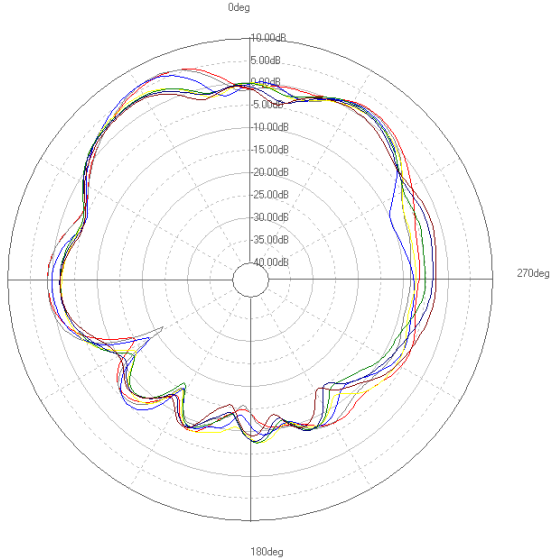
XY-plane



YZ-plane



ZX-plane

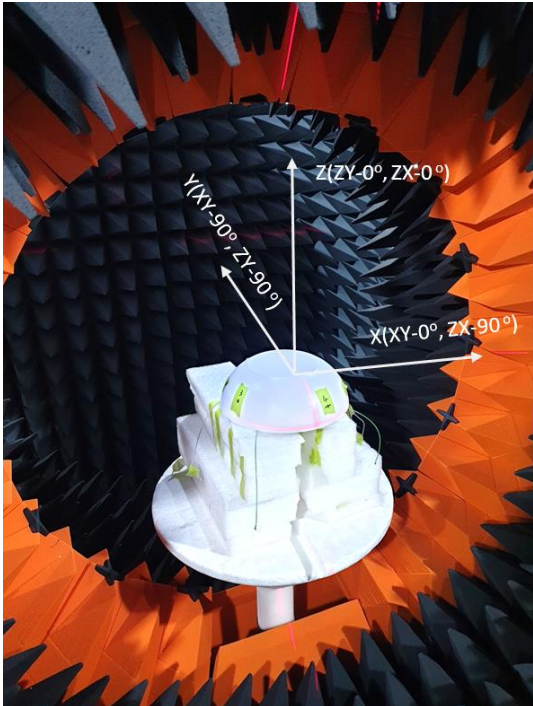


Pattern ANT-4 (5G FR1)

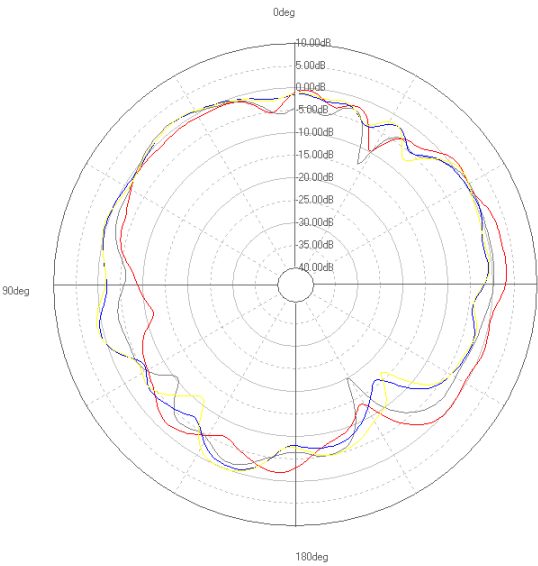
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
5150	54%	-2.7	4.0
5500	48%	-3.2	3.1
5850	51%	-2.9	3.9
5925	53%	-2.8	4.0

Legend

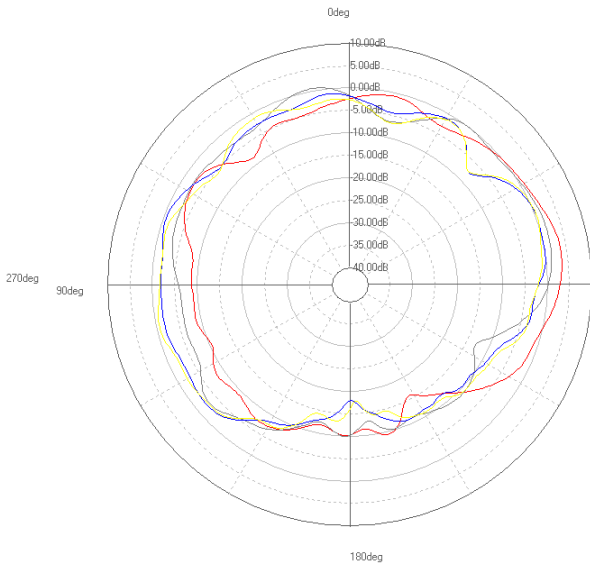
- 5150.00(MHz)
- 5500.00(MHz)
- 5850.00(MHz)
- 5925.00(MHz)



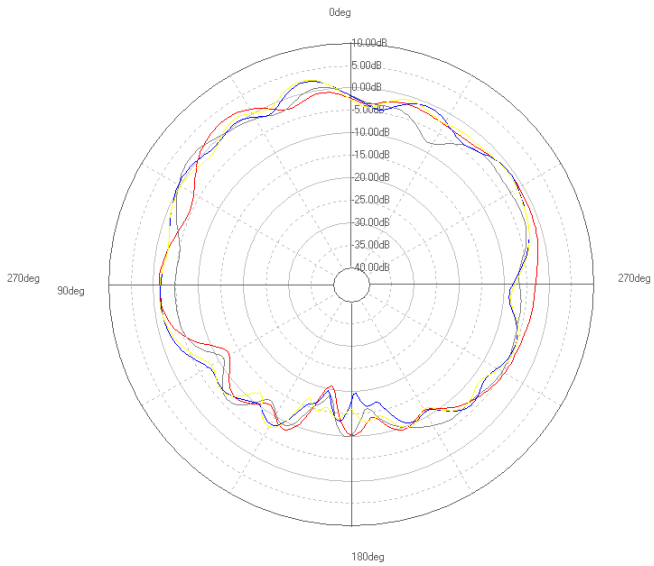
XY-plane



YZ-plane

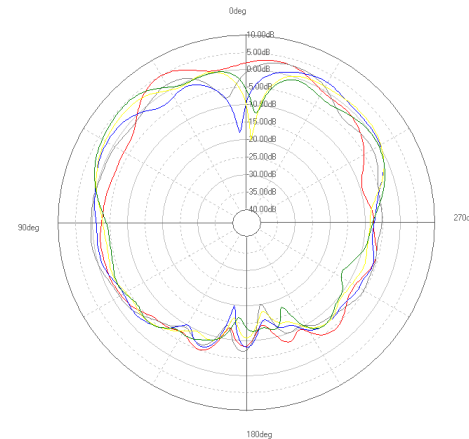
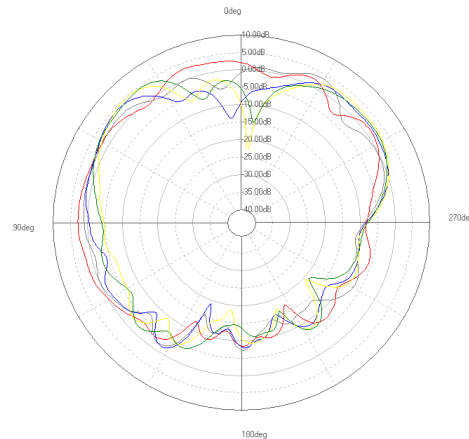
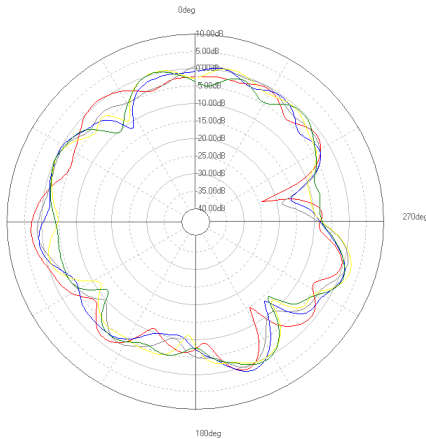
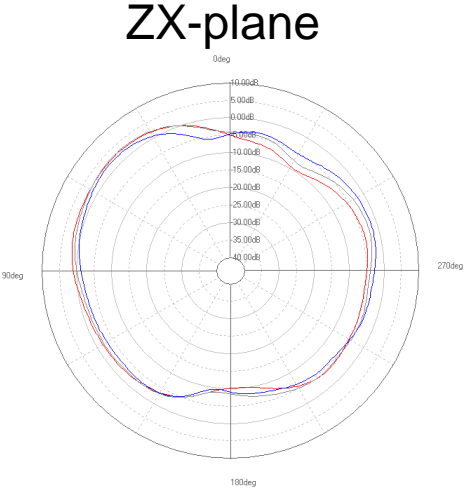
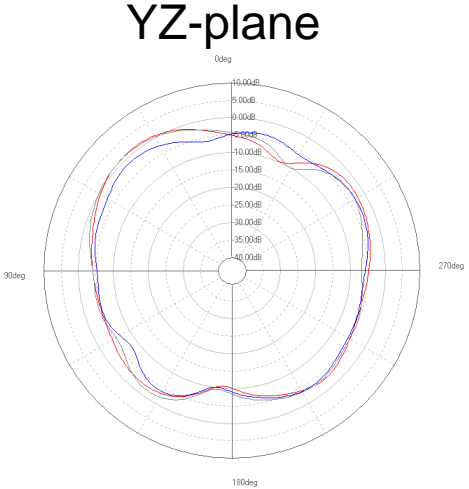
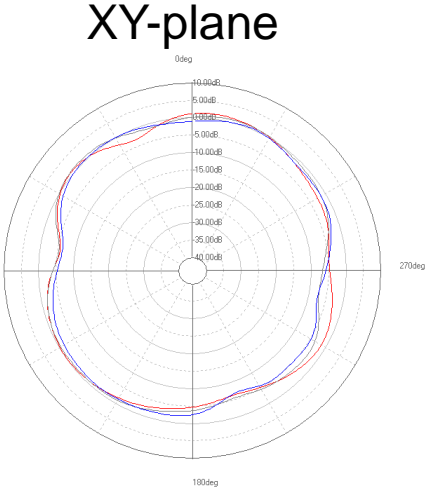
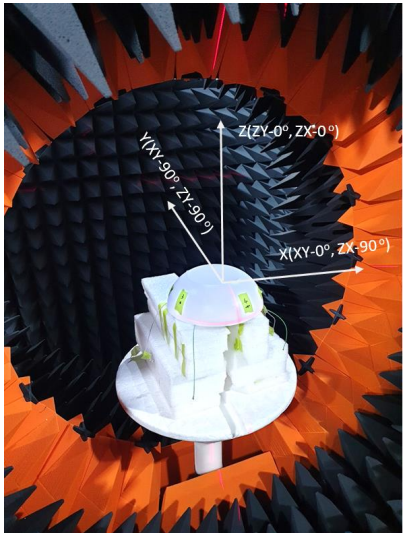


ZX-plane



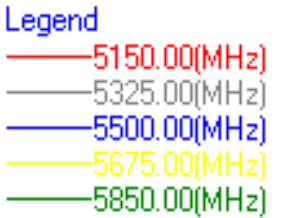
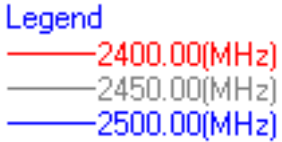
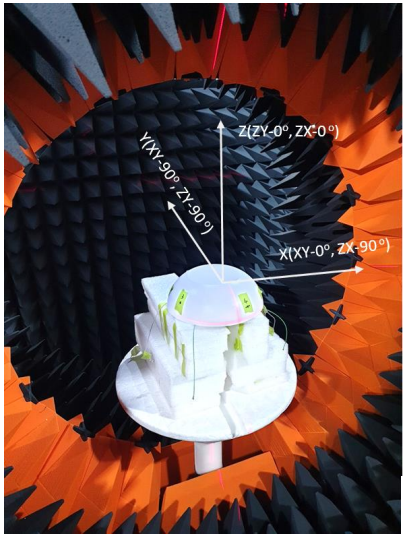
Pattern ANT-5 (WiFi Dual Band)

Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
2400	65%	-1.9	3.7
2450	68%	-1.7	4.5
2500	61%	-2.2	4.4
5150	63%	-2.0	5.9
5325	63%	-2.0	4.7
5500	62%	-2.1	4.4
5675	65%	-1.9	5.2
5850	62%	-2.1	4.7

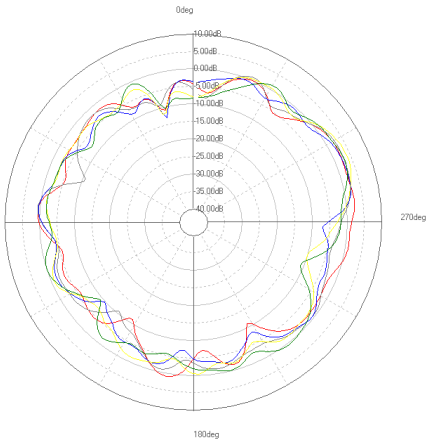
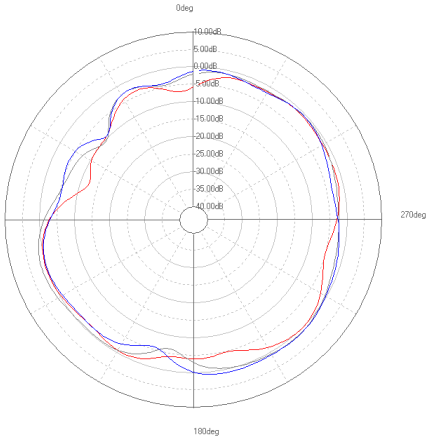


Pattern ANT-6 (WiFi Dual Band)

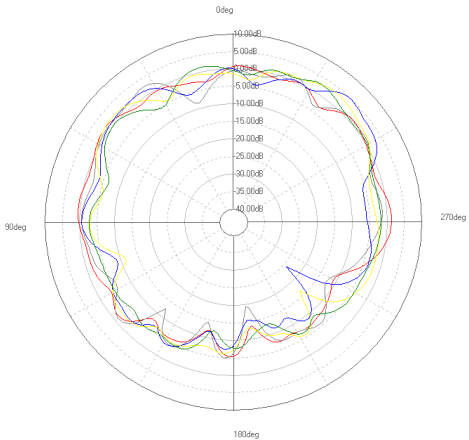
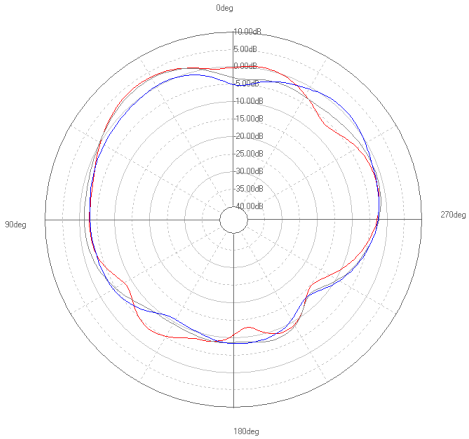
Frequency (MHz)	3D		
	Efficiency	Avg. Gain	Peak Gain
2400	59%	-2.3	3.9
2450	67%	-1.7	3.7
2500	63%	-2.0	2.8
5150	61%	-2.1	4.9
5325	63%	-2.0	3.9
5500	63%	-2.0	4.6
5675	65%	-1.9	4.0
5850	65%	-1.9	4.4



XY-plane



YZ-plane



ZX-plane

