



# FF 5G System Antenna Specification

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# 5G System Antenna

## Requirement summary

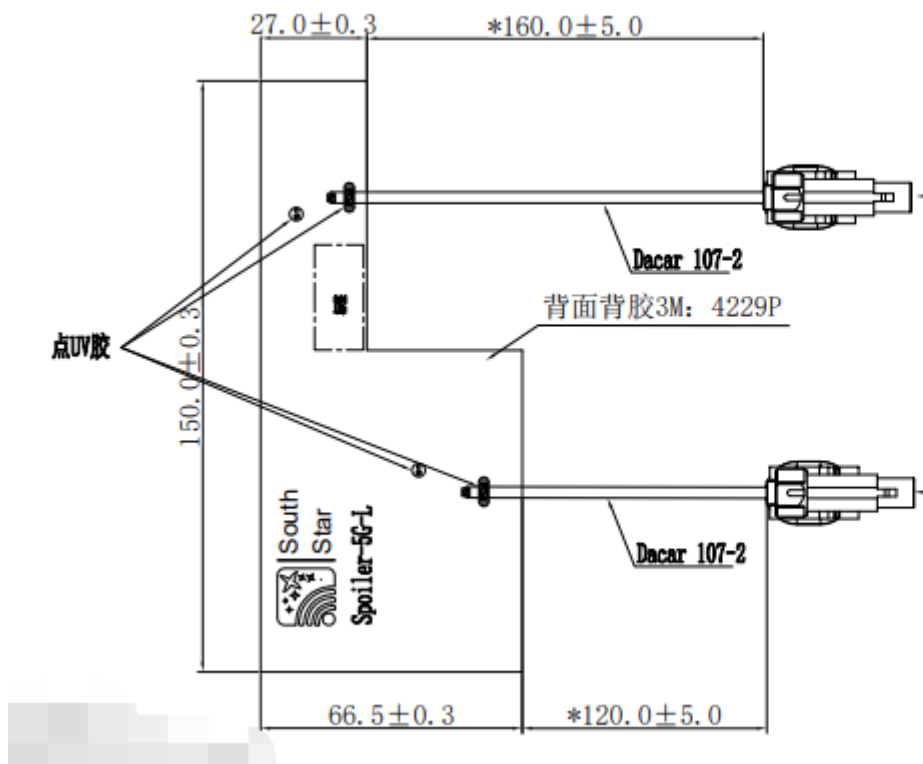
		Bands	Efficiency	Isolation	polarization	Directivity	Diagnosis
			spec	spec	spec	spec	SPEC
<b>5Gx</b> <i>(x=1,2,3)</i>	MIMO1	617-960 MHz 1710-2690 MHz 3300-5000 MHz	≥40%	≥20dB	Vertical	Omni	Build in <b>10K RES to GND</b> for diagnosis
	MIMO2	617-960 MHz 1710-2690 MHz 3300-5000 MHz					
	MIMO3	1710-2690 MHz 3300-5000 MHz					
	MIMO4	1710-2690 MHz 3300-5000 MHz					
<b>WIFI 6</b>	MIMO1	2.4-2.484 GHz 5.150-5.850 GHz	≥40%				
	MIMO2	2.4-2.484 GHz 5.150-5.850 GHz					
<b>BT</b>	BT	2.4-2.484 GHz	≥50%				
<b>C-V2X</b>	TRX1	5770-5925MHz					
	TRX2	5770-5925MHz					
<b>GNSS</b> <i>(L1&amp;L5)</i>	GNSS	1561-1610MHz 1175-1178MHz			RHCP	Directional	

GNSS Active Antenna, LNA Gain=**20dB**, NF < 1.5

POC V=3.3V

# Spoiler 5G Antenna

## 2D Dimension , Left Antenna



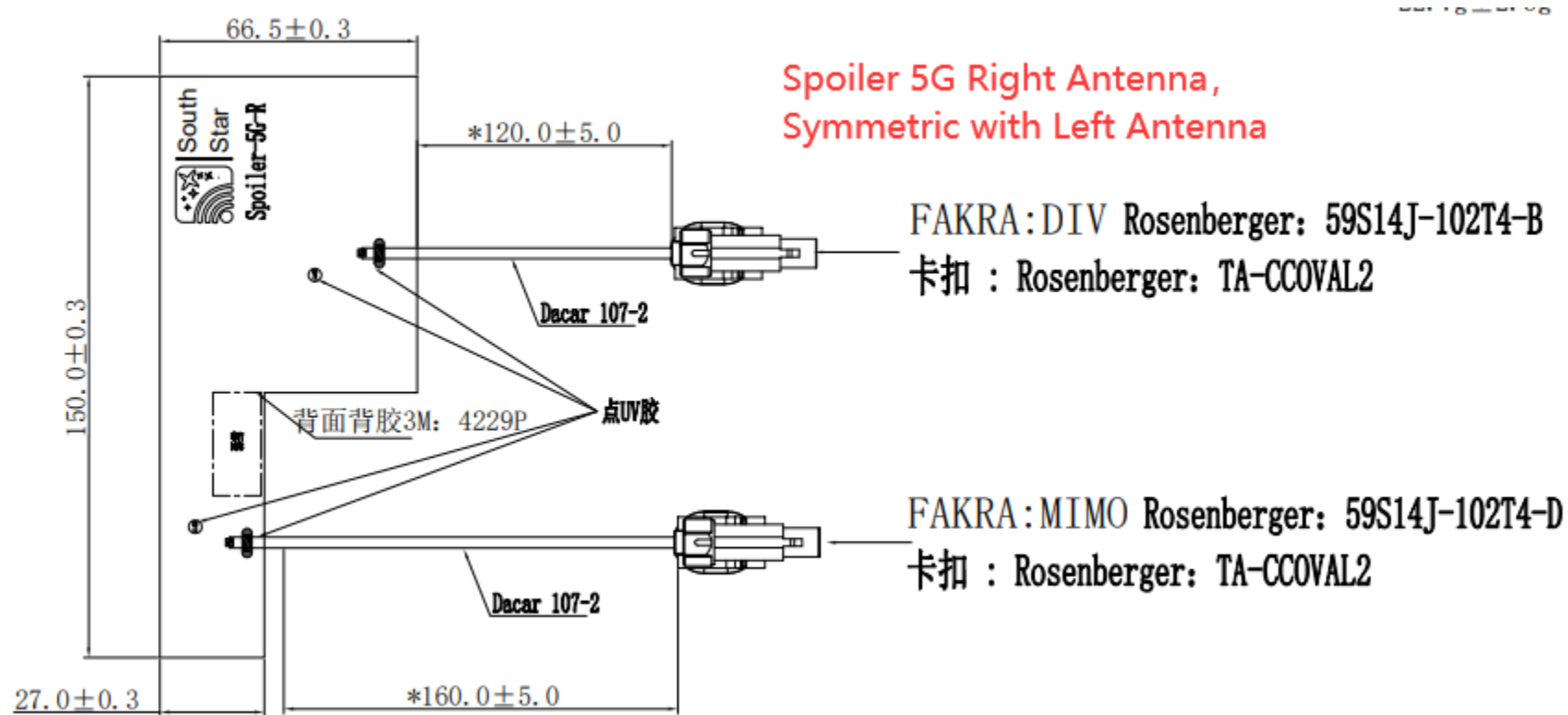
Spoiler 5G Left Antenna,  
Symmetric with Right Antenna

FAKRA:MIMO Rosenberger: 59S14J-102T4-D  
卡扣 : Rosenberger: TA-CCOVAL2

FAKRA:DIV Rosenberger: 59S14J-102T4-B  
卡扣 : Rosenberger: TA-CCOVAL2

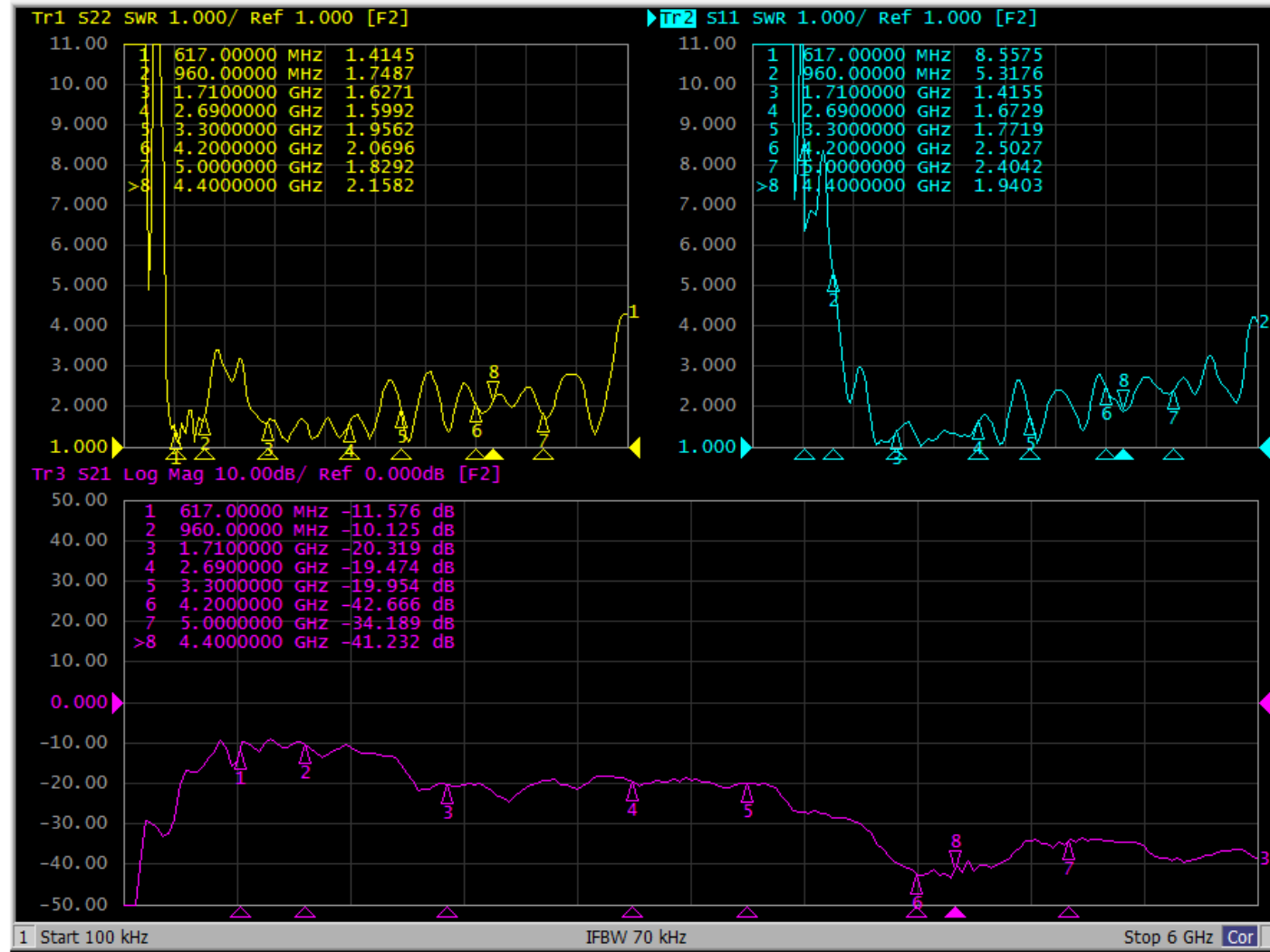
# Spoiler 5G Antenna

## 2D Dimension , Right antenna



# Spoiler 5G Antenna

## VSWR and Isolation



# Spoiler 5G Antenna

## Gain and Efficiency, 5G MAIN/DIV Antenna

Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
610	44.38	-3.53	-0.13
620	51.4	-2.89	0.15
630	58.7	-2.31	0.58
640	67.45	-1.71	1.41
650	66.06	-1.8	1.46
660	63.25	-1.99	1.11
670	59.06	-2.29	0.46
680	55.13	-2.59	0.21
690	57.03	-2.44	0.63
700	58.01	-2.37	0.87
710	69.1	-1.61	1.78
720	66.07	-1.8	1.32
730	64.78	-1.89	1.2
740	66.55	-1.77	1
750	72.73	-1.38	1.58
760	78.2	-1.07	2
770	69.56	-1.58	1.66
780	71.25	-1.47	2.01
790	81.92	-0.87	2.72
800	83.23	-0.8	2.93
810	76.67	-1.15	2.84
820	70.98	-1.49	2.22
830	63.86	-1.95	2.37
840	53.5	-2.72	1.76
850	47.33	-3.25	1.76
860	46.6	-3.32	1.71
870	44.93	-3.47	1.7
880	44.68	-3.5	1.45
890	47.83	-3.2	1.55
900	46.72	-3.3	0.92
910	42.06	-3.76	-0.21
920	43.9	-3.58	0.61
930	43.54	-3.61	1.72
940	43.31	-3.63	1.46
950	40.76	-3.9	0.77
960	40.29	-3.95	-0.01

Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
1710	82.58	-0.83	4.09
1730	65.33	-1.85	3.47
1750	65.61	-1.83	3.6
1770	78.39	-1.06	4.36
1790	67.15	-1.73	3.46
1810	72.9	-1.37	3.57
1830	72.92	-1.37	3.64
1850	71.11	-1.48	3.43
1870	72.67	-1.39	3.37
1890	71.41	-1.46	3.36
1910	70	-1.55	3.06
1930	82.57	-0.83	3.94
1950	84.56	-0.73	3.95
1970	86.6	-0.63	3.99
1990	86.19	-0.65	4.05
2010	75.79	-1.2	3.9
2030	73.99	-1.31	3.58
2050	75.64	-1.21	3.25
2070	74.57	-1.27	3.27
2090	64.96	-1.87	2.65
2110	56.68	-2.47	2.03
2130	57.31	-2.42	2.19
2150	61.99	-2.08	2.59
2170	59.6	-2.25	2.5
2190	65.31	-1.85	2.91
2210	68.08	-1.67	3.18
2230	65.2	-1.86	3.01
2250	64.9	-1.88	3.14
2270	63.73	-1.96	3.11
2290	65.98	-1.81	3.16

Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
2310	66.84	-1.75	3.3
2330	58.95	-2.3	2.91
2350	64.08	-1.93	3.33
2370	64.39	-1.91	3.32
2390	69.97	-1.55	3.46
2410	67.95	-1.68	3.14
2430	64.11	-1.93	2.84
2450	69.72	-1.57	3.26
2470	74.34	-1.29	3.72
2490	71.22	-1.47	3.93
2510	69.2	-1.6	3.85
2530	82.95	-0.81	4.78
2550	77.15	-1.13	4.69
2570	78.31	-1.06	4.83
2590	67.54	-1.7	4.27
2610	76.3	-1.17	4.71
2630	75.74	-1.21	4.76
2650	61.14	-2.14	3.99
2670	61.31	-2.12	3.84
2690	66.82	-1.75	3.79

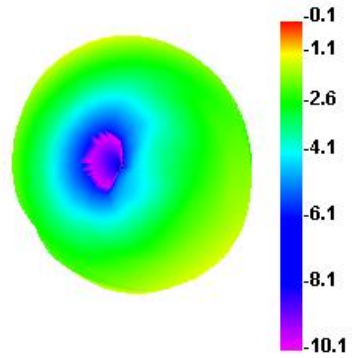
Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
3300	44.67	-3.5	2.95
3350	50.81	-2.94	3.17
3400	64.56	-1.9	4.97
3450	58.43	-2.33	4.58
3500	52.54	-2.8	3.76
3550	49.05	-3.09	3.45
3600	47.07	-3.27	2.99
3650	52.21	-2.82	3.12
3700	56.89	-2.45	3.26
3750	62.05	-2.07	3.82
3800	66.58	-1.77	3.86
3850	79.67	-0.99	4.92
3900	83.01	-0.81	5.2
3950	68.4	-1.65	4.26
4000	65.58	-1.83	4.14
4050	69.78	-1.56	4.52
4100	63.05	-2	3.96
4150	67.31	-1.72	4.17
4200	81.6	-0.88	4.86

Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
4250	84.78	-0.72	4.88
4300	83.14	-0.8	5.04
4350	83.76	-0.77	4.82
4400	79.56	-0.99	4.82
4450	75.34	-1.23	4.9
4500	65.22	-1.86	4.23
4550	67.24	-1.72	4.65
4600	66.87	-1.75	4.85
4650	62.34	-2.05	4.59
4700	61.53	-2.11	4.72
4750	59.93	-2.22	4.76
4800	56.3	-2.49	4.46
4850	54.43	-2.64	4.23
4900	61.24	-2.13	4.6
4950	63.08	-2	4.62
5000	65.79	-1.82	4.92

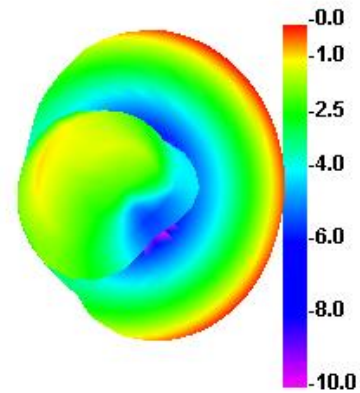
# Spoiler 5G Antenna

3D Pattern, 5G MAIN/DIV Antenna

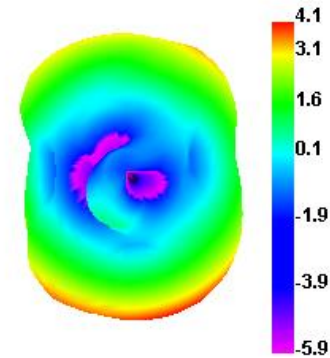
610.000MHz



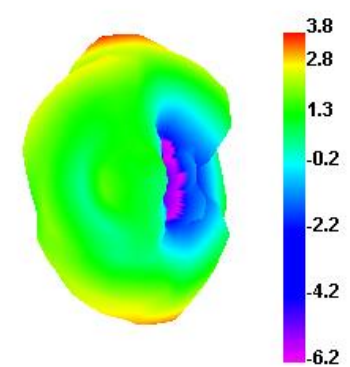
960.000MHz



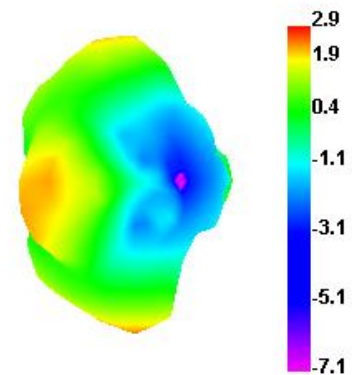
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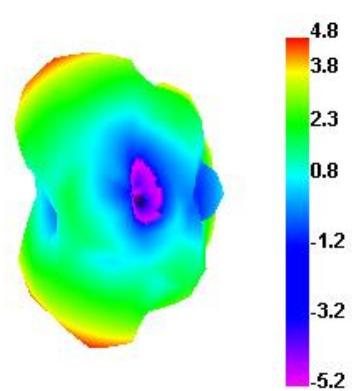
2690.000MHz



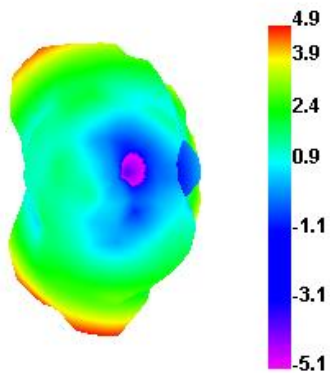
3300.000MHz



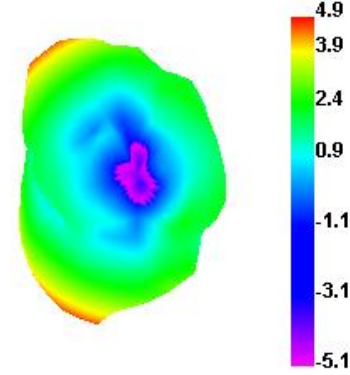
4400.000MHz



4200.000MHz



5000.000MHz





# Spoiler 5G Antenna

## Gain and Efficiency, 5G MIMO Antenna

Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)
1710	84.63	-0.72	5.38
1730	70.93	-1.49	4.88
1750	67.57	-1.7	5.06
1770	80.24	-0.96	5.76
1790	70.73	-1.5	5.09
1810	68.75	-1.63	5.03
1830	71.16	-1.48	5
1850	65.97	-1.81	4.46
1870	62.04	-2.07	4.03
1890	64.61	-1.9	4.2
1910	59.24	-2.27	3.79
1930	74.79	-1.26	4.65
1950	78.33	-1.06	4.67
1970	79.09	-1.02	4.68
1990	86.79	-0.62	5.16
2010	74.59	-1.27	4.69
2030	74.14	-1.3	4.53
2050	79.2	-1.01	4.59
2070	74.84	-1.26	4.42
2090	69.08	-1.61	3.94
2110	58.87	-2.3	2.78
2130	58.3	-2.34	2.53
2150	64.06	-1.93	2.9
2170	58.92	-2.3	2.61

Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)
2190	67.32	-1.72	3.2
2210	67.98	-1.68	3.06
2230	64.1	-1.93	2.89
2250	66.67	-1.76	3.16
2270	61.98	-2.08	2.9
2290	63.38	-1.98	3.15
2310	65.06	-1.87	3.52
2330	56.47	-2.48	3.11
2350	62.01	-2.08	3.54
2370	61.1	-2.14	3.58
2390	66.82	-1.75	3.91
2410	67.62	-1.7	3.9
2430	64.07	-1.93	3.6
2450	72.03	-1.42	4.16
2470	76.22	-1.18	4.3
2490	74.24	-1.29	4.12
2510	75.29	-1.23	4.17
2530	87.36	-0.59	4.8
2550	81.34	-0.9	4.53
2570	80.83	-0.92	4.44
2590	70.92	-1.49	3.64
2610	79.35	-1	4.19
2630	74.85	-1.26	3.95
2650	61.42	-2.12	3.15
2670	60.66	-2.17	3.26
2690	64.95	-1.87	3.74

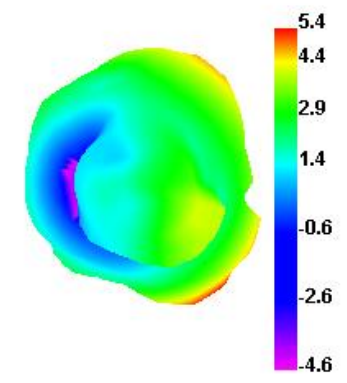
Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)
3300	54.21	-2.66	2.16
3350	65.6	-1.83	3.11
3400	79.67	-0.99	4.11
3450	68.14	-1.67	3.66
3500	61.77	-2.09	3.09
3550	54.61	-2.63	2.3
3600	49.78	-3.03	1.77
3650	52	-2.84	1.66
3700	54.98	-2.6	2.24
3750	60.99	-2.15	3.13
3800	66.63	-1.76	3.42
3850	79.99	-0.97	4.51
3900	83.43	-0.79	4.74
3950	66.91	-1.75	3.59
4000	61.75	-2.09	2.72
4050	63.73	-1.96	2.92
4100	56.95	-2.44	2.75
4150	62.38	-2.05	3.36
4200	77.89	-1.09	4.89

Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)
4250	82.53	-0.83	5.28
4300	82.65	-0.83	5.16
4350	84.34	-0.74	5.62
4400	81.18	-0.91	5.29
4450	78	-1.08	4.92
4500	68.91	-1.62	4.55
4550	70.47	-1.52	4.42
4600	67.56	-1.7	4.02
4650	61.19	-2.13	3.61
4700	61.57	-2.11	3.5
4750	60.94	-2.15	3.18
4800	60.24	-2.2	3.15
4850	57.8	-2.38	2.92
4900	64.64	-1.89	3.29
4950	64.8	-1.88	3.43
5000	65.55	-1.83	3.69

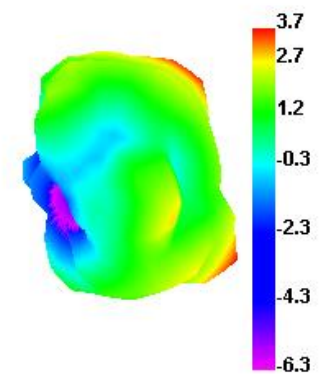
# Spoiler 5G Antenna

3D Pattern, 5G MIMO Antenna

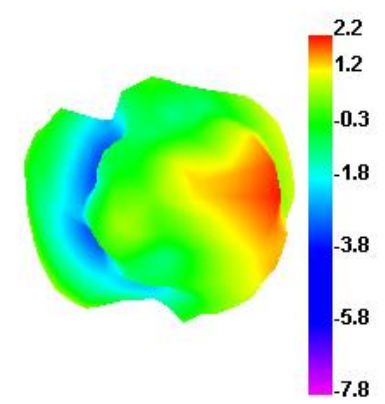
1710.000MHz



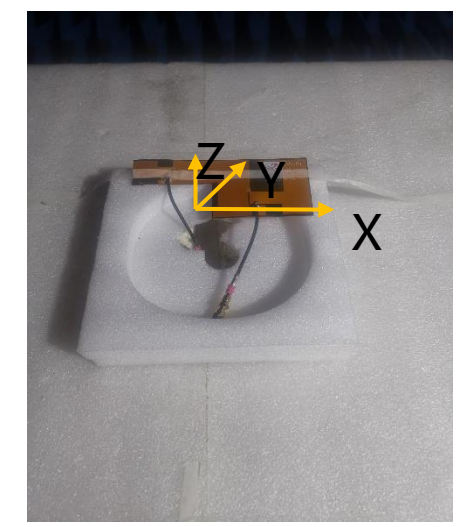
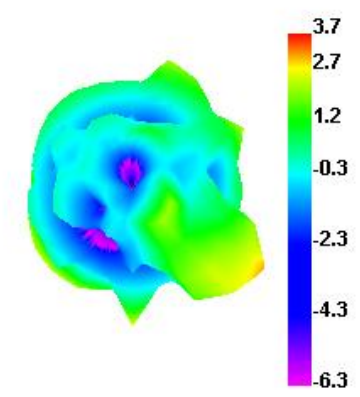
2690.000MHz



3300.000MHz

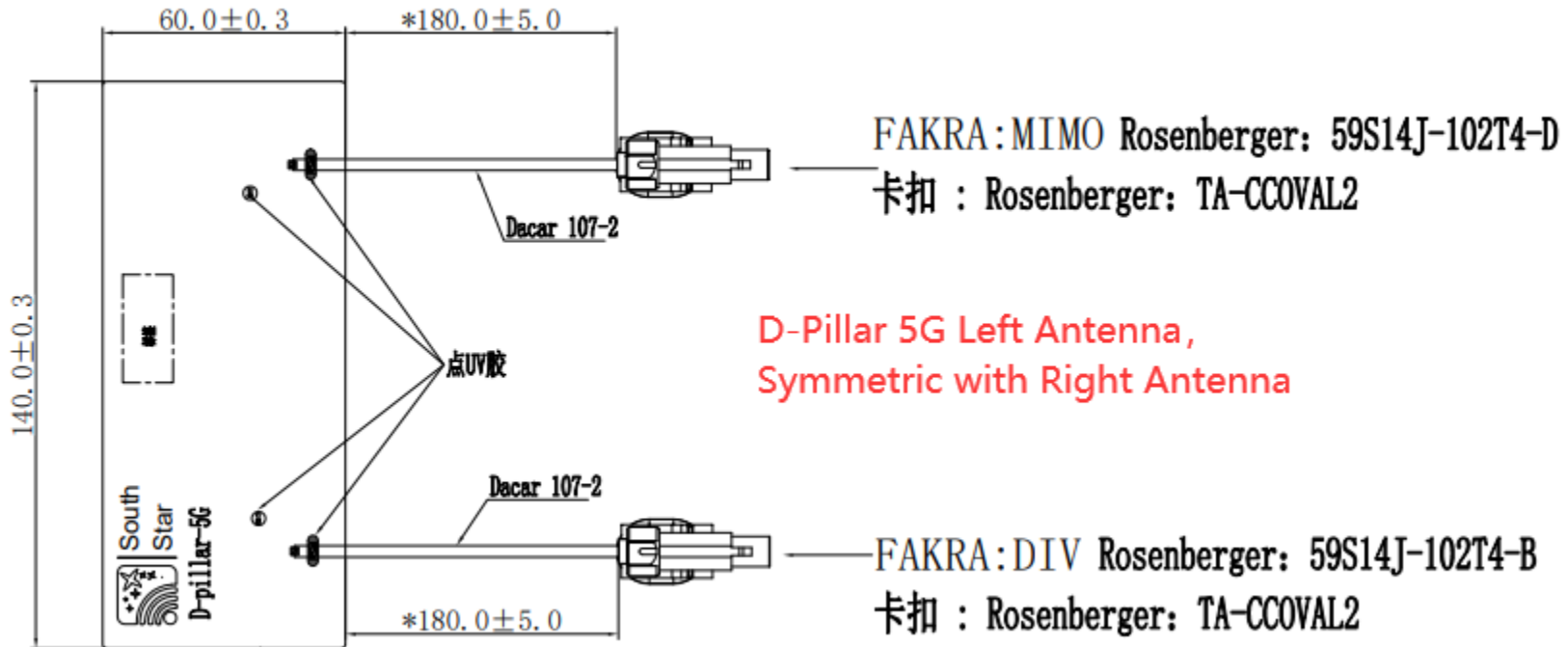


5000.000MHz



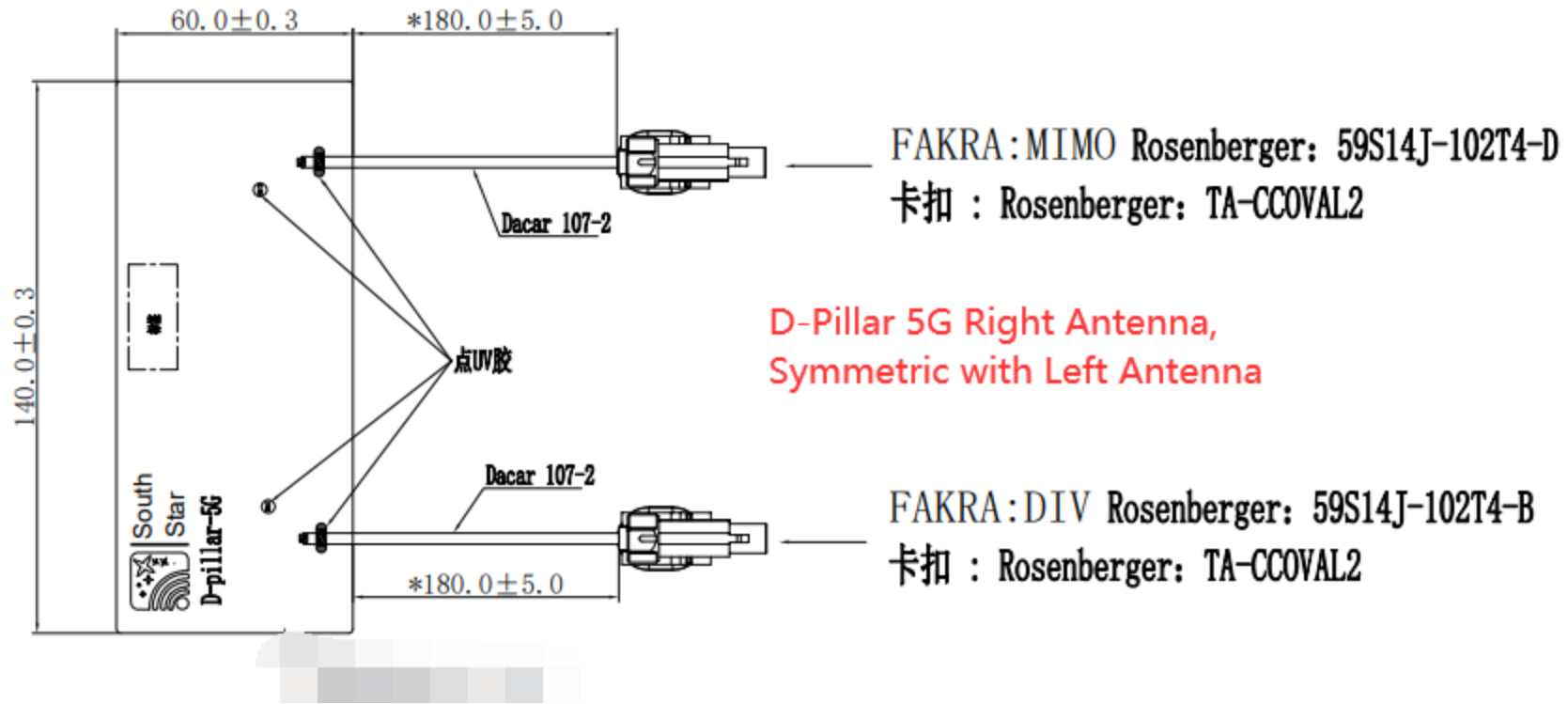
# D-Pillar 5G Antenna

## 2D Dimension , Left Antenna



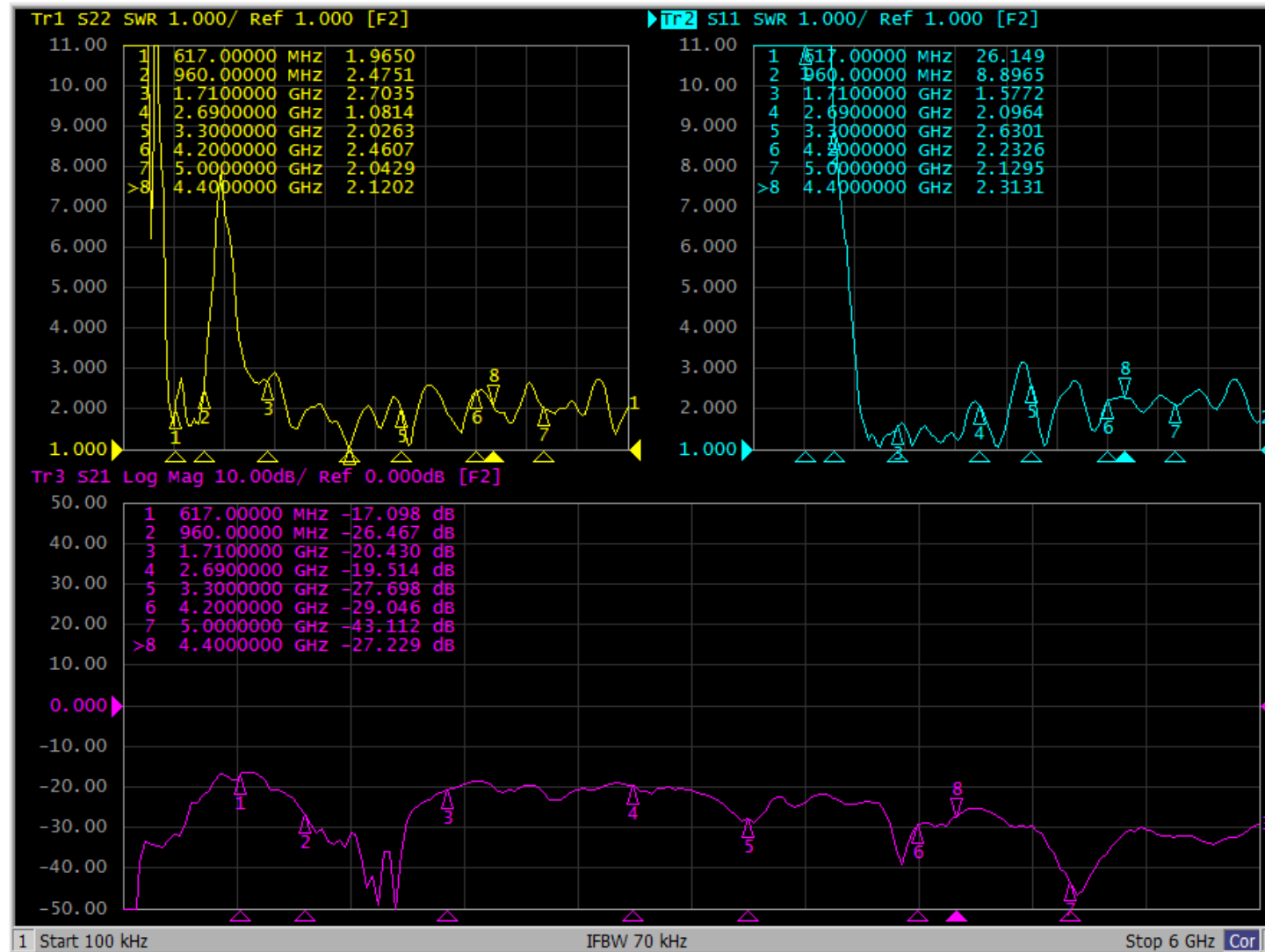
# D-Pillar 5G Antenna

2D Dimension , Right antenna



# D-Pillar 5G Antenna

## VSWR and Isolation



# D-Pillar 5G Antenna

## Gain and Efficiency, 5G MAIN/DIV Antenna

Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
610	42.49	-3.72	-1.42
620	49.99	-3.01	-0.94
630	57.64	-2.39	0.27
640	65.84	-1.81	1.31
650	63.07	-2	1.57
660	58.62	-2.32	1.48
670	53.98	-2.68	0.92
680	50.89	-2.93	0.56
690	53.71	-2.7	0.76
700	56.22	-2.5	1.17
710	68.53	-1.64	2.68
720	67.3	-1.72	2.89
730	67.52	-1.71	3.38
740	69.98	-1.55	3.42
750	77.02	-1.13	3.95
760	84.24	-0.75	3.98
770	76.49	-1.16	3.45
780	80.92	-0.92	3.5
790	93.07	-0.31	4
800	92.7	-0.33	4.19
810	83.27	-0.8	3.92
820	74.77	-1.26	3.68
830	67.31	-1.72	3.13
840	55.61	-2.55	2.31
850	47.96	-3.19	1.31
860	45.92	-3.38	1.01
870	43.56	-3.61	0.87
880	43.25	-3.64	1.04
890	46.47	-3.33	1.63
900	46.47	-3.33	1.62
910	48.4	-3.15	1.68
920	50.55	-2.96	1.6
930	48.74	-3.12	1.12
940	44.89	-3.48	0.73
950	40.42	-3.93	0.16
960	43.48	-3.62	-0.67

Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
1710	71.09	-1.48	3.59
1730	56.69	-2.46	2.99
1750	51.93	-2.85	2.75
1770	66.27	-1.79	4.2
1790	54.07	-2.67	3.65
1810	56.19	-2.5	3.68
1830	59.92	-2.22	3.57
1850	53.86	-2.69	3.03
1870	58.43	-2.33	3.39
1890	60.64	-2.17	3.32
1910	57.95	-2.37	2.9
1930	78.16	-1.07	4.14
1950	75.82	-1.2	4.03
1970	80.55	-0.94	4.13
1990	84.25	-0.74	4.24
2010	68.07	-1.67	3.35
2030	71.62	-1.45	3.98
2050	69.7	-1.57	3.94
2070	66.35	-1.78	3.92
2090	64.74	-1.89	4.02
2110	51.77	-2.86	3.16
2130	55.67	-2.54	3.34
2150	62.59	-2.03	3.73
2170	56.3	-2.49	3.21
2190	68.39	-1.65	4.04
2210	64.64	-1.9	3.72
2230	60.77	-2.16	3.3
2250	61.33	-2.12	3.25
2270	52.91	-2.76	2.74
2290	57.09	-2.43	3.13

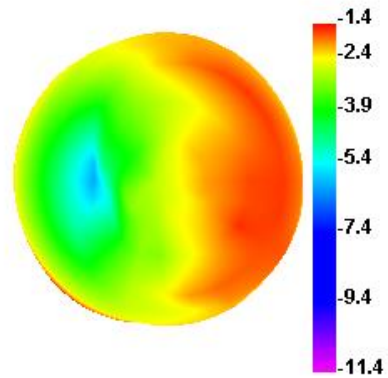
Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
2310	55.79	-2.53	2.79
2330	46.57	-3.32	1.67
2350	54.28	-2.65	2.09
2370	51.93	-2.85	1.88
2390	59.48	-2.26	2.59
2410	60.52	-2.18	2.69
2430	55.74	-2.54	2.35
2450	66.45	-1.77	3.23
2470	69.03	-1.61	3.66
2490	69.68	-1.57	3.83
2510	73.9	-1.31	4
2530	82.91	-0.81	4.5
2550	82.21	-0.85	4.58
2570	85.08	-0.7	4.78
2590	72.46	-1.4	4.21
2610	87.83	-0.56	5.24
2630	83.12	-0.8	5.12
2650	67.75	-1.69	4.3
2670	71.41	-1.46	4.69
2690	72.85	-1.38	4.86
3000	69.88	-1.56	4.63
3050	60.85	-2.16	3.85
3100	63.52	-1.97	3.83
3150	50.8	-2.94	2.94
3200	41.61	-3.81	2.25
3250	43.76	-3.59	2.7
3300	42.71	-3.69	2.01
3350	51.58	-2.88	2.91
3400	66.88	-1.75	4.06
3450	60.54	-2.18	3.63
3500	55.79	-2.53	3.28
3550	52.6	-2.79	3.15
3600	49.13	-3.09	3.15
3650	51.41	-2.89	3.31
3700	54.49	-2.64	3.25
3750	59.24	-2.27	3.76

Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
3800	62.42	-2.05	4.18
3850	71.01	-1.49	5.09
3900	74.3	-1.29	5.07
3950	66.46	-1.77	4.65
4000	69.22	-1.6	4.83
4050	74.67	-1.27	5.02
4100	65.12	-1.86	4.29
4150	65.14	-1.86	4.42
4200	72.08	-1.42	4.83
4250	70.46	-1.52	4.18
4300	67.14	-1.73	3.78
4350	68.64	-1.63	3.72
4400	66.9	-1.75	3.9
4450	65.36	-1.85	3.94
4500	58.64	-2.32	3.48
4550	62.31	-2.05	4.06
4600	60.38	-2.19	4.03
4650	55.43	-2.56	3.88
4700	53.7	-2.7	4.11
4750	50.81	-2.94	3.92
4800	48.26	-3.16	3.76
4850	47.64	-3.22	3.33
4900	54.13	-2.67	3.73
4950	54.86	-2.61	3.69
5000	55.77	-2.54	3.48

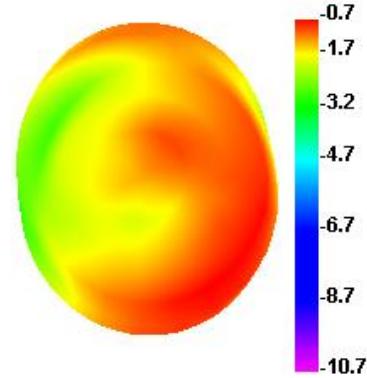
# D-Pillar 5G Antenna

## 3D Pattern, 5G MAIN/DIV Antenna

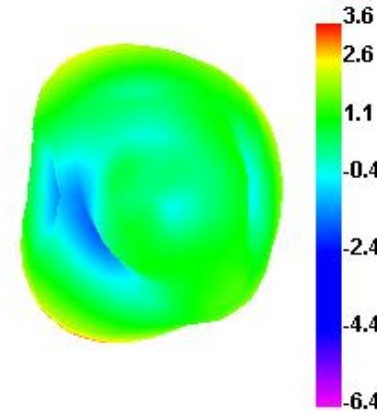
610.000MHz



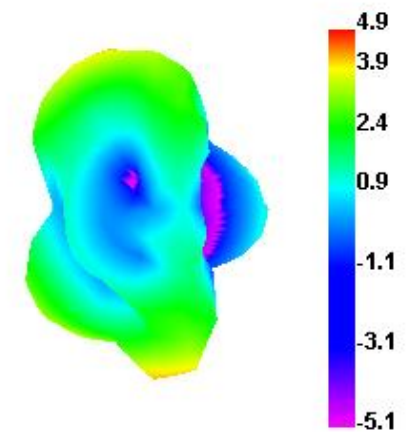
960.000MHz



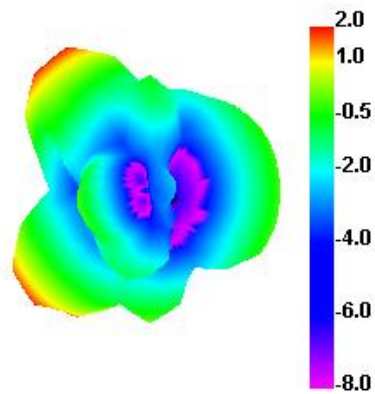
1710.000MHz



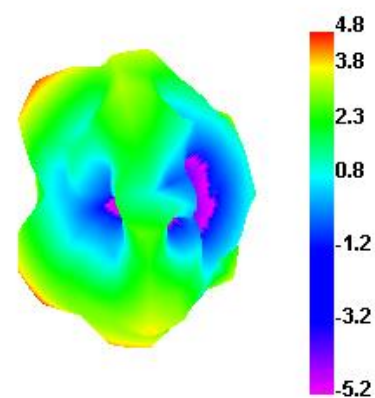
2690.000MHz



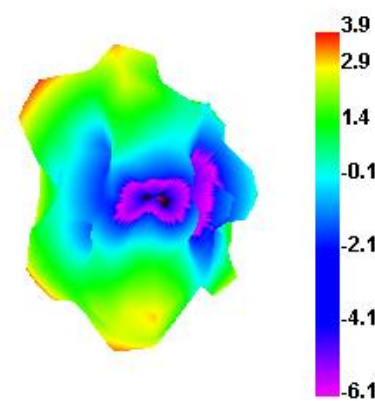
3300.000MHz



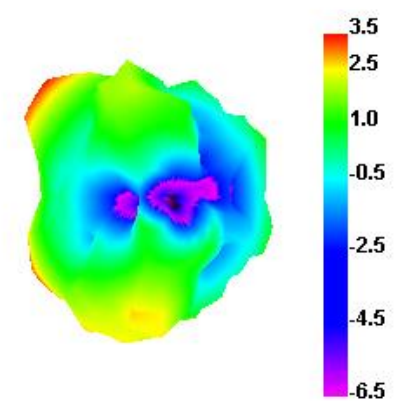
4200.000MHz



4400.000MHz



5000.000MHz



# D-Pillar 5G Antenna

## Gain and Efficiency, 5G MIMO Antenna

Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)
1710	84.44	-0.73	4.24
1730	68.51	-1.64	3.33
1750	68.71	-1.63	3.51
1770	84.15	-0.75	4.23
1790	73.54	-1.33	3.82
1810	77.17	-1.13	4
1830	76.96	-1.14	4.03
1850	74.02	-1.31	3.72
1870	71.74	-1.44	3.36
1890	70.07	-1.54	3.23
1910	66.45	-1.77	3.27
1930	79.88	-0.98	4.19
1950	84	-0.76	4.19
1970	85.35	-0.69	4
1990	90.44	-0.44	4.26
2010	81.38	-0.9	3.89
2030	78.08	-1.07	3.62
2050	84.15	-0.75	4.08
2070	79.31	-1.01	3.87
2090	71.38	-1.46	3.55
2110	63.24	-1.99	3.24
2130	62.14	-2.07	3.4
2150	70.73	-1.5	4.17
2170	66.16	-1.79	4.08
2190	74.69	-1.27	4.69
2210	78.35	-1.06	5.15

Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)
2230	73.94	-1.31	5.03
2250	75.89	-1.2	5.17
2270	70.86	-1.5	5.1
2290	71.93	-1.43	5.36
2310	73.53	-1.34	5.42
2330	62.56	-2.04	4.75
2350	67.04	-1.74	5.2
2370	67.39	-1.71	5.25
2390	72.69	-1.39	5.62
2410	70.9	-1.49	5.57
2430	67.69	-1.69	5.4
2450	73.03	-1.36	5.59
2470	76.99	-1.14	5.7
2490	72.37	-1.4	5.37
2510	69.72	-1.57	5.16
2530	84.12	-0.75	5.93
2550	74.63	-1.27	5.41
2570	76.36	-1.17	5.33
2590	68.28	-1.66	4.51
2610	74.91	-1.25	4.66
2630	75.38	-1.23	4.34
2650	60.98	-2.15	2.93
2670	62.13	-2.07	2.55
2690	69.49	-1.58	2.51

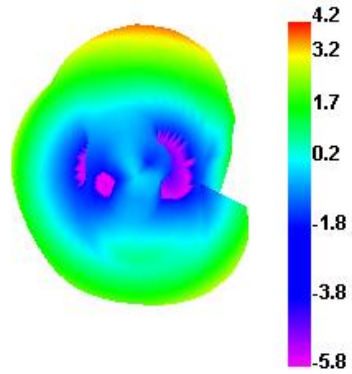
Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)
3300	46.07	-3.37	1.51
3350	62.04	-2.07	3.17
3400	78.16	-1.07	3.98
3450	70.31	-1.53	3.33
3500	66.81	-1.75	3.24
3550	61.99	-2.08	2.48
3600	56.86	-2.45	2.27
3650	55.83	-2.53	2.02
3700	54.21	-2.66	1.37
3750	58.14	-2.36	1.67
3800	60.25	-2.2	2.1
3850	68.39	-1.65	2.53
3900	72.68	-1.39	2.66
3950	66.96	-1.74	2.42
4000	72.36	-1.41	2.83
4050	80.78	-0.93	3.58
4100	71.49	-1.46	3.29
4150	74.16	-1.3	3.48
4200	83.08	-0.81	3.79
4250	81.97	-0.86	3.95
4300	76.87	-1.14	3.92
4350	76.73	-1.15	3.82
4400	75.43	-1.22	3.51
4450	73.95	-1.31	3.49
4500	65.12	-1.86	3.21
4550	66.58	-1.77	3.17
4600	65.43	-1.84	3.62
4650	61.97	-2.08	3.51
4700	62.51	-2.04	3.61
4750	61.35	-2.12	3.43
4800	57.29	-2.42	3.25
4850	54.24	-2.66	3.3
4900	61.99	-2.08	3.96
4950	63.03	-2	3.92
5000	64.45	-1.91	3.99



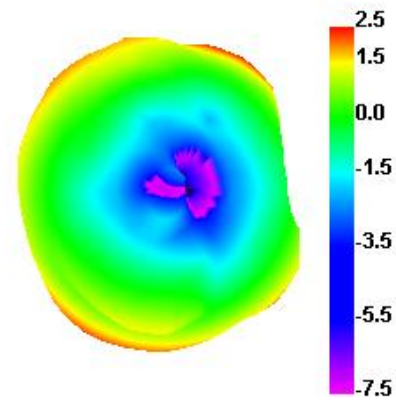
# D-Pillar 5G Antenna

## 3D Pattern, 5G MIMO Antenna

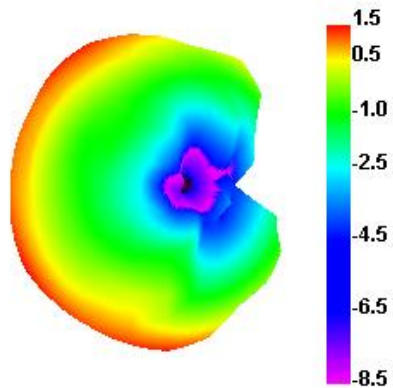
1710.000MHz



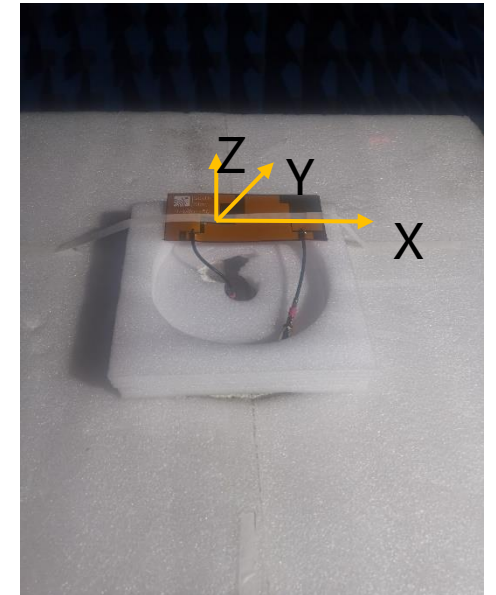
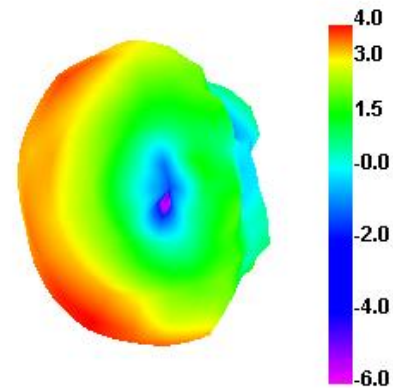
2690.000MHz



3300.000MHz

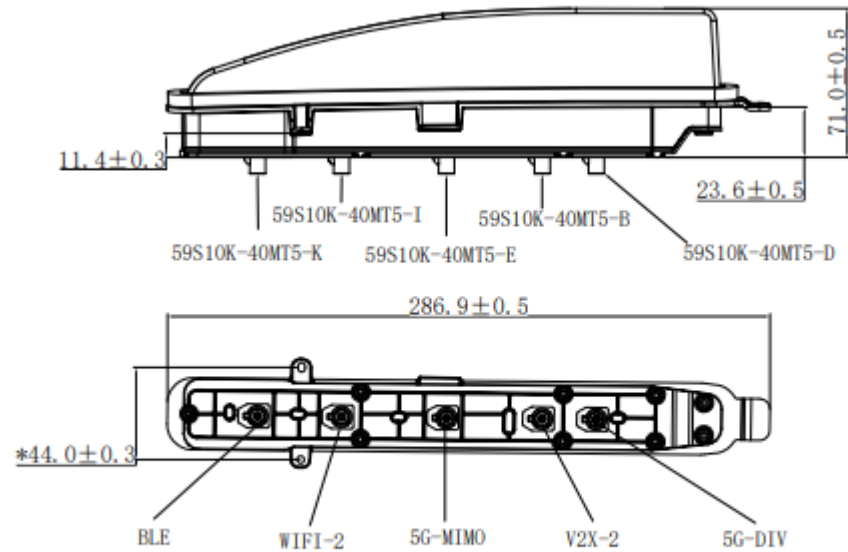


5000.000MHz

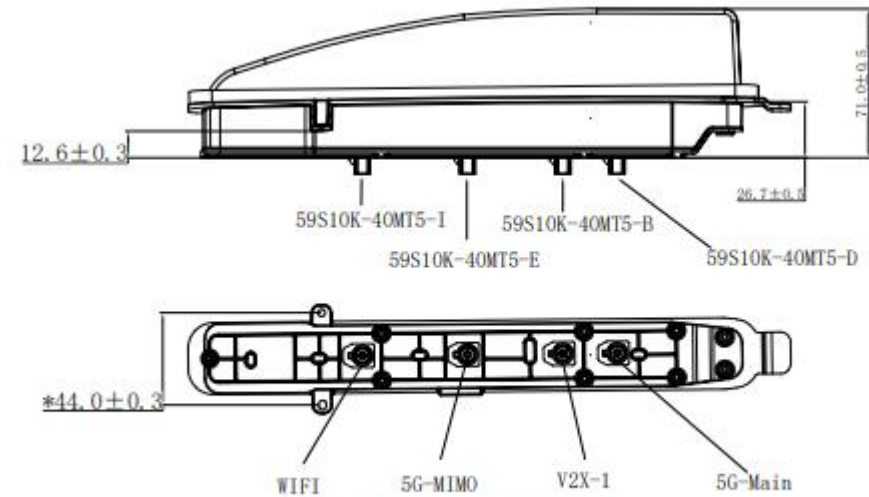


# SharkFin Left Antenna

## 2D Dimension



**SharkFin Left Antenna**

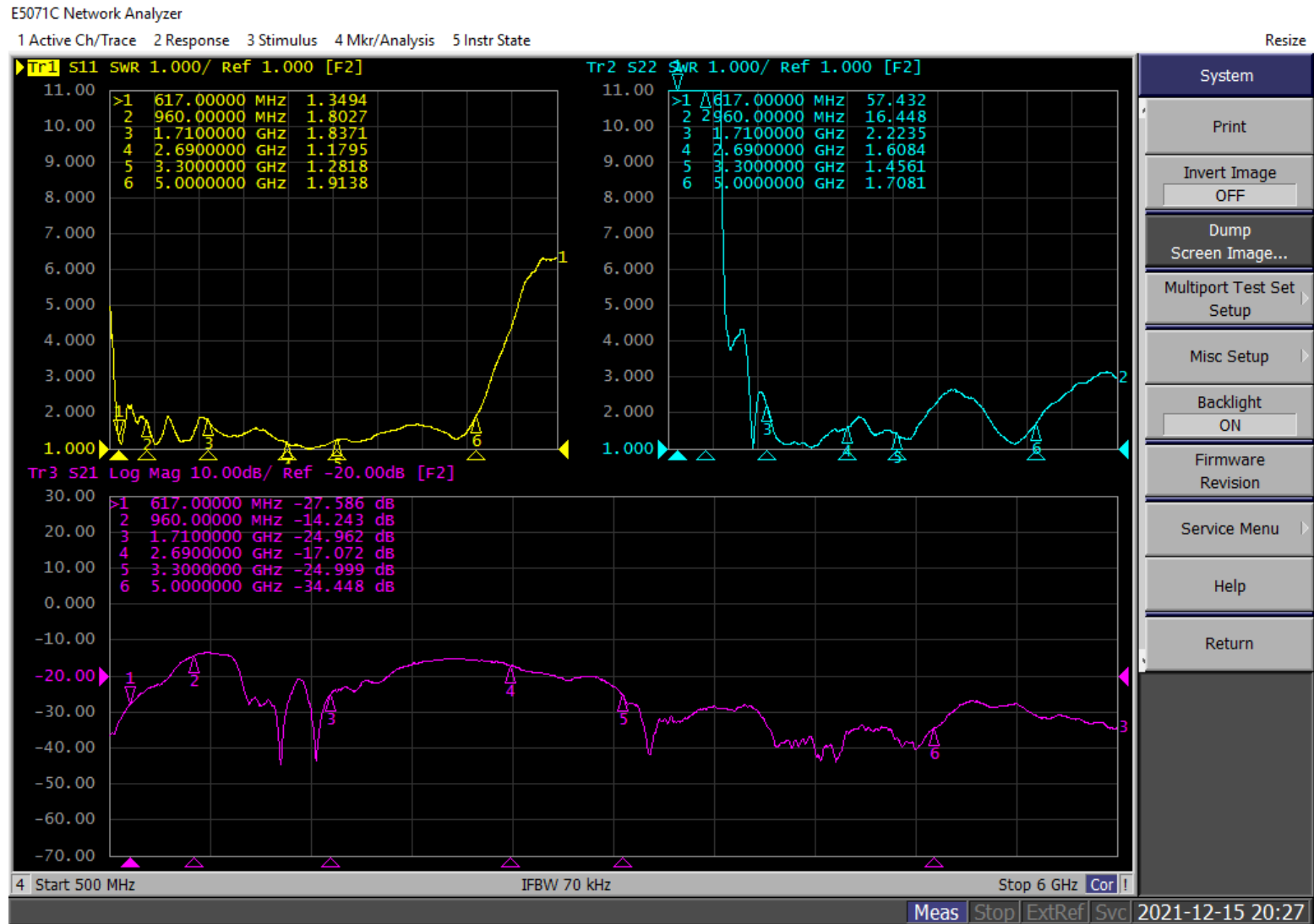


**SharkFin Right Antenna**

SharkFin Right Antenna is less a BLE antenna component than SharkFin Left Antenna, others antenna components of SharkFin right Antenna are the same with the SharkFin Left antenna.

# SharkFin Left Antenna

## VSWR and Isolation, 5G MAIN/DIV and 5G MIMO



# SharkFin Left Antenna

## Gain and Efficiency, 5G MAIN/DIV Antenna

frequency	gain	efficiency	efficiency
频率(MHz)	增益(dBi)	效率(dB)	效率(%)
617	-0.84	-3.97	40.08
647	-0.97	-3.69	42.8
677	-0.91	-4.25	37.62
697	-1	-4.37	36.57
698	-0.97	-4.34	36.78
718	-0.39	-3.87	41.04
738	-0.8	-4.66	34.23
758	-0.7	-4.66	34.17
778	-0.16	-4.48	35.67
798	0.32	-4.42	36.12
818	1.14	-3.82	41.54
838	1.06	-3.84	41.26
858	1.78	-3.82	41.5
878	1.95	-3.14	48.57
898	1.99	-3.17	48.24
918	2.46	-2.2	60.2

frequency	gain	efficiency	efficiency
频率(MHz)	增益(dBi)	效率(dB)	效率(%)
938	2.25	-1.93	64.07
958	1.65	-2.44	57.05
978	2.52	-2.03	62.7
1710	1.15	-1.91	64.47
1740	0.71	-1.92	64.22
1770	1.3	-2.01	62.9
1800	1.94	-1.82	65.73
1830	1.36	-2.18	60.49
1860	1.68	-1.7	67.53
1890	2.07	-1.92	64.34
1920	2.54	-1.72	67.32
1950	2.34	-1.57	69.59
1980	2.65	-1.44	71.73
2010	1.83	-1.74	66.93
2040	2.42	-1.53	70.27
2070	2.26	-1.78	66.38
2100	2.46	-1.56	69.78
2130	2.08	-1.98	63.35
2160	2.3	-1.9	64.53
2190	2.49	-1.44	71.73
2220	2.76	-1.61	69.01

frequency	gain	efficiency	efficiency
频率(MHz)	增益(dBi)	效率(dB)	效率(%)
2250	2.57	-1.73	67.21
2280	1.81	-1.69	67.69
2310	1.51	-1.95	63.83
2340	1.23	-1.86	65.11
2370	0.91	-2	63.17
2400	1.69	-1.7	67.66
2430	1.56	-1.96	63.66
2460	1.83	-1.82	65.81
2490	2.48	-1.46	71.43
2520	2.82	-1.67	68.08
2550	2.41	-1.92	64.29
2580	2.31	-1.92	64.29
2610	3.04	-1.59	69.39
2640	3.06	-1.81	65.93
2670	2.88	-2.1	61.67
2700	3.39	-1.64	68.55
3300	2.54	-1.43	71.95
3350	2.12	-1.45	71.69

# SharkFin Left Antenna

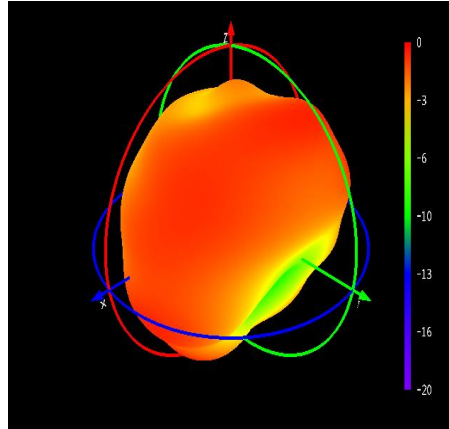
## Gain and Efficiency, 5G MAIN/DIV Antenna

frequency	gain	efficiency	efficiency
频率(MHz)	增益(dBi)	效率(dB)	效率(%)
3400	2.1	-1.46	71.42
3450	2.12	-1.29	74.32
3500	1.74	-1.6	69.15
3550	1.8	-1.48	71.16
3600	1.64	-1.52	70.44
3650	1.63	-1.44	71.74
3700	1	-1.65	68.43
3750	0.89	-1.66	68.27
3800	0.98	-1.6	69.24
3850	1.05	-1.9	64.55
3900	1.11	-1.94	64.04
3950	1.64	-1.63	68.74
4000	1.02	-1.88	64.82
4050	0.95	-1.98	63.36
4100	1.03	-1.94	63.91
4150	1.39	-1.65	68.45
4200	1.17	-2.15	60.92
4250	1.15	-2.09	61.77
4300	1.89	-1.46	71.4
4350	1.59	-1.91	64.34

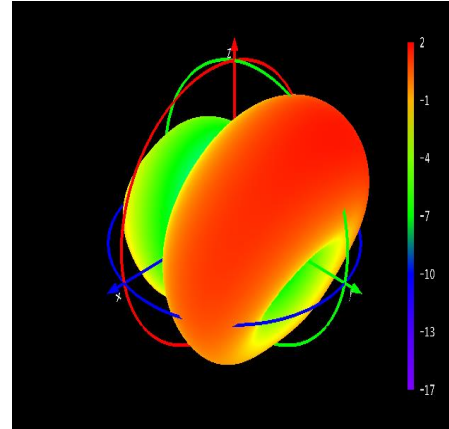
frequency	gain	efficiency	efficiency
频率(MHz)	增益(dBi)	效率(dB)	效率(%)
4400	1.97	-1.71	67.44
4450	3.11	-1.27	74.71
4500	3.18	-1.46	71.41
4550	3.35	-1.4	72.52
4600	3.73	-1.08	77.98
4650	3.83	-0.97	80.02
4700	3.83	-1.29	74.25
4750	3.96	-1.26	74.89
4800	4.38	-1.26	74.9
4850	4.15	-1.41	72.35
4900	5.1	-1.25	74.93
4950	5.24	-1.19	76.09
5000	4.81	-1.66	68.26

# SharkFin Left Antenna

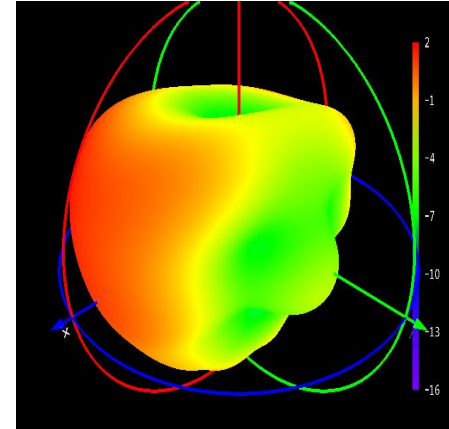
## 3D Pattern, 5G MAIN/DIV Antenna



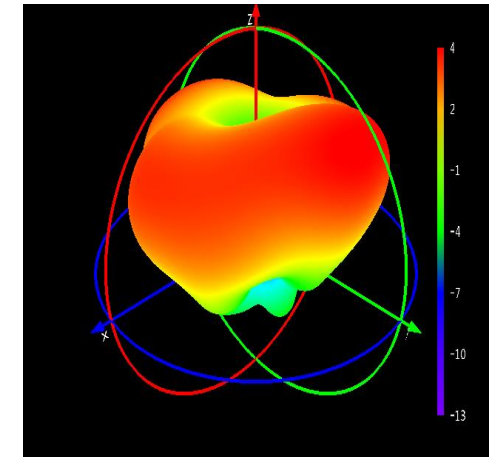
617MHz



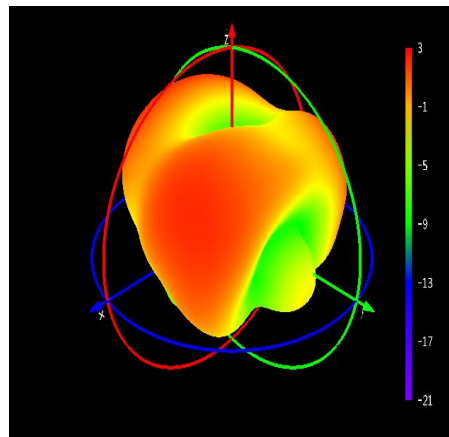
958MHz



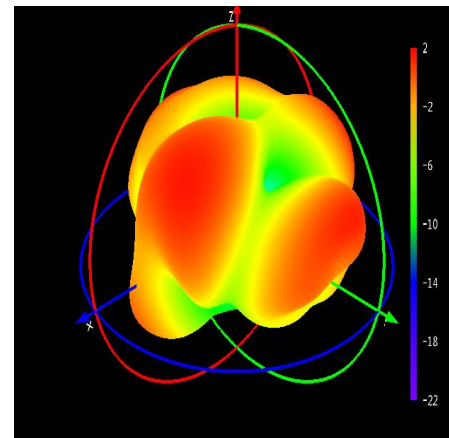
1710MHz



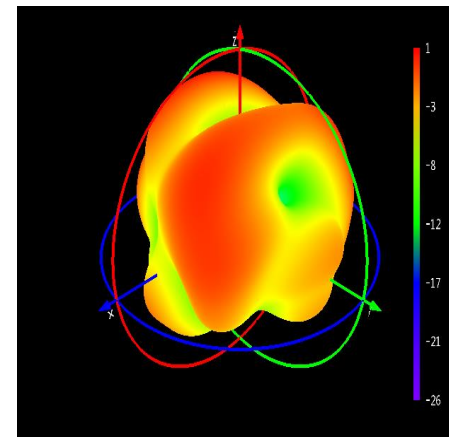
2700MHz



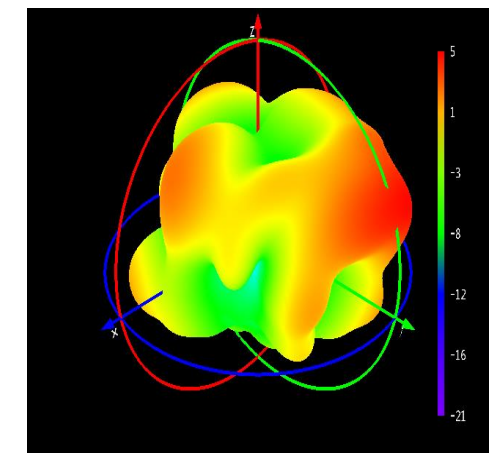
3300MHz



4200MHz



3800MHz



5000MHz

# SharkFin Left Antenna

## Gain and Efficiency, 5G MIMO Antenna

frequency	gain	efficiency	efficiency
频率(MHz)	增益(dBi)	效率(dB)	效率(%)
1710	1.83	-2.3	58.83
1740	1.07	-2.29	58.97
1770	1.24	-1.99	63.27
1800	1.02	-2.24	59.72
1830	0.75	-2.45	56.93
1860	0.75	-2.41	57.47
1890	1.51	-2.39	57.72
1920	2.14	-2.3	58.95
1950	2.13	-2.35	58.25
1980	2.54	-2.25	59.62
2010	2.11	-2.24	59.77
2040	2.35	-2.33	58.45
2070	2.67	-2.42	57.29
2100	2.93	-2.48	56.46
2130	2.88	-2.57	55.31
2160	2.57	-2.6	54.91
2190	2.85	-2.39	57.69
2220	3.19	-2.66	54.19
2250	3.36	-2.38	57.8
2280	1.75	-2.73	53.34
2310	1.38	-3.01	50.05

frequency	gain	efficiency	efficiency
频率(MHz)	增益(dBi)	效率(dB)	效率(%)
2340	1.8	-2.79	52.58
2370	1.77	-2.65	54.36
2400	1.16	-2.89	51.41
2430	1.1	-3.17	48.22
2460	1.26	-2.99	50.2
2490	1.72	-2.49	56.34
2520	1.81	-2.67	54.13
2550	1.24	-3.27	47.15
2580	1.47	-2.89	51.43
2610	1.93	-2.62	54.72
2640	1.72	-2.83	52.15
2670	2.02	-2.89	51.44
2700	2.91	-2.5	56.26
3300	2.41	-1.78	66.35

# SharkFin Left Antenna

## Gain and Efficiency, 5G MIMO Antenna

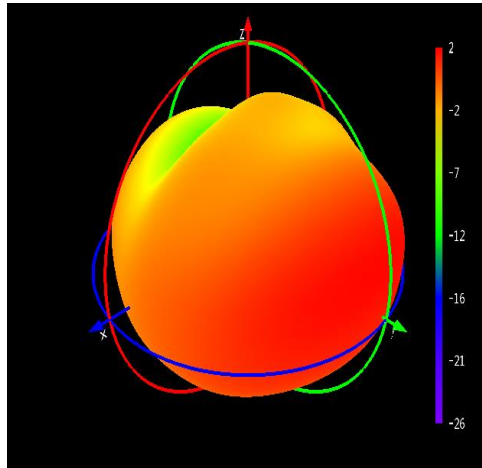
frequency	gain	efficiency	efficiency
频率(MHz)	增益(dBi)	效率(dB)	效率(%)
3350	2.11	-1.76	66.76
3400	1.83	-1.82	65.76
3450	1.83	-1.74	66.98
3500	1.38	-2	63.17
3550	1.15	-2.18	60.5
3600	0.84	-2.22	60.03
3650	1.43	-1.84	65.5
3700	0.89	-2.12	61.33
3750	0.8	-2.5	56.21
3800	1.27	-2.04	62.55
3850	0.73	-2.78	52.67
3900	0.7	-2.95	50.69
3950	0.74	-2.83	52.15
4000	0.81	-2.32	58.62
4050	0.1	-2.85	51.93
4100	0.15	-2.83	52.16

frequency	gain	efficiency	efficiency
频率(MHz)	增益(dBi)	效率(dB)	效率(%)
4150	0.56	-2.62	54.64
4200	0.9	-2.58	55.26
4250	0.17	-3.29	46.84
4300	1.32	-2.01	62.96
4350	1.79	-1.89	64.76
4400	1.79	-2.12	61.37
4450	3.28	-1.45	71.59
4500	3.42	-1.6	69.11
4550	3.85	-1.3	74.07
4600	3.97	-1.34	73.46
4650	4.59	-0.83	82.69
4700	4.39	-1.23	75.33
4750	4.39	-1.16	76.64
4800	4.54	-1.26	74.84
4850	4.28	-1.41	72.21
4900	5.28	-1.13	77.05
4950	5.14	-1.21	75.68
5000	4.82	-1.52	70.44

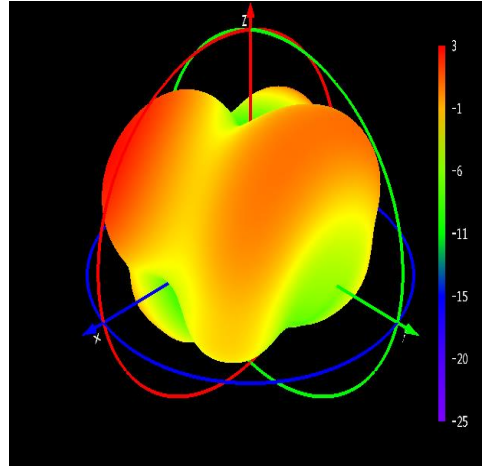


# SharkFin Left Antenna

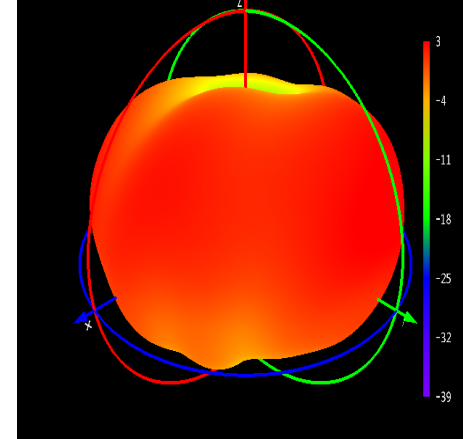
## 3D Pattern, 5G MIMO Antenna



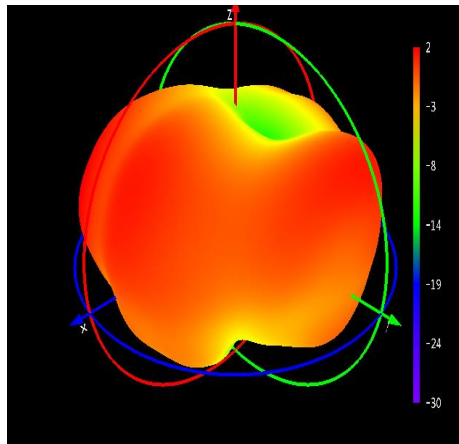
1710MHz



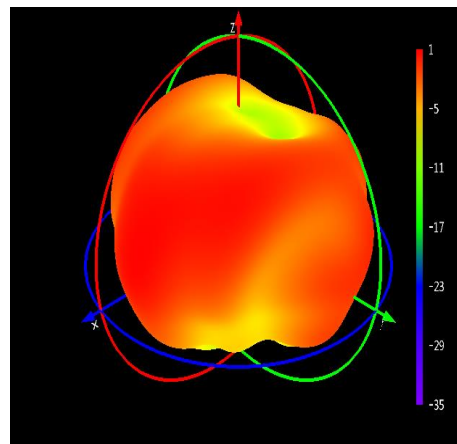
2700MHz



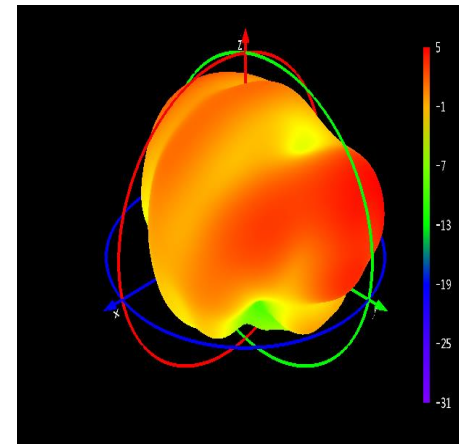
3300MHz



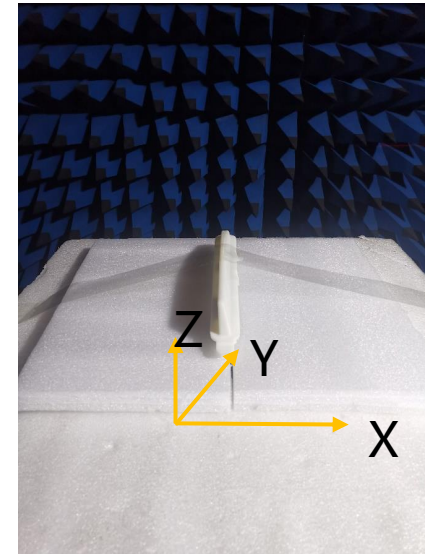
3800MHz



4200MHz

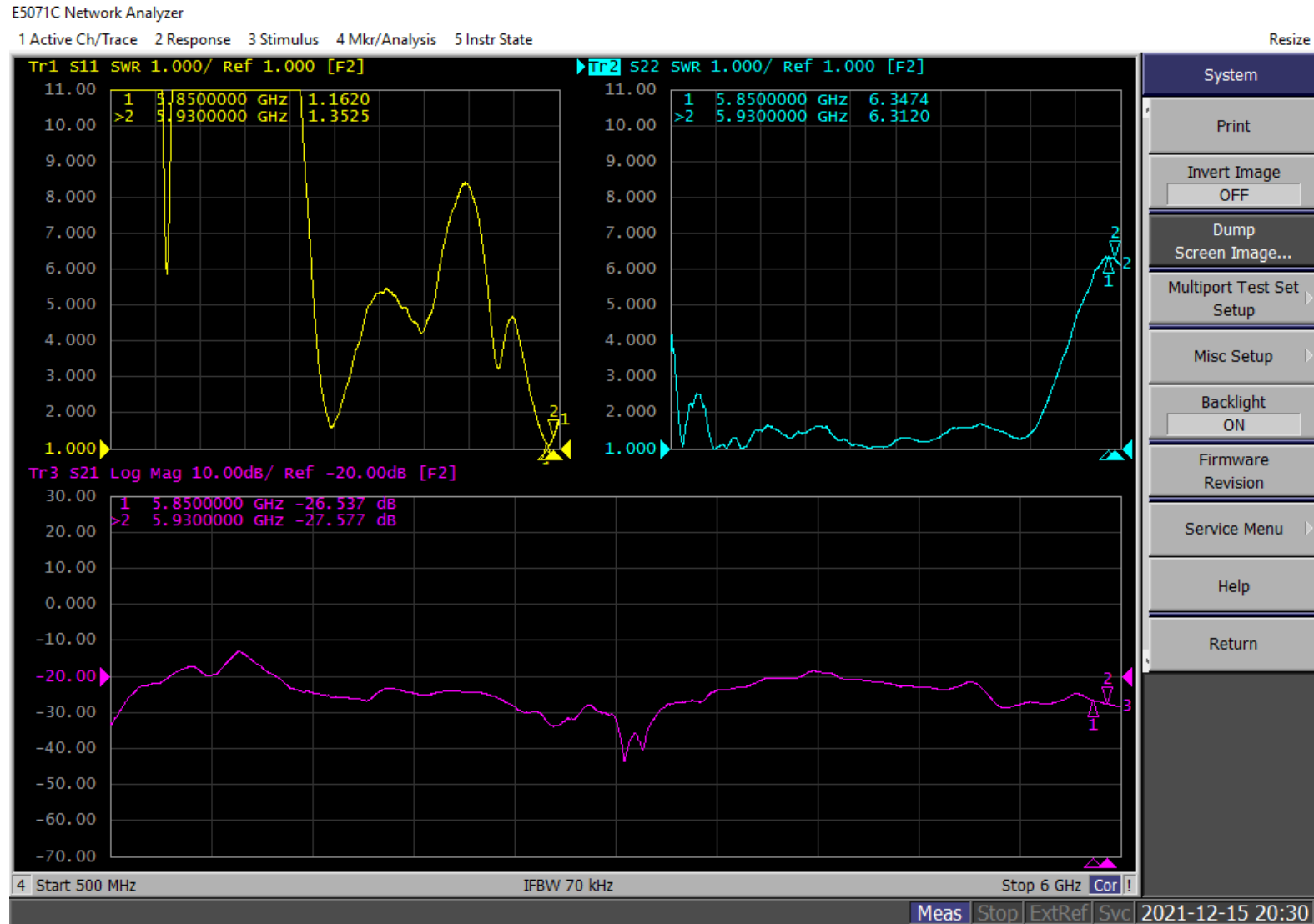


5000MHz



# SharkFin Left Antenna

## VSWR of C-V2X Antenna , Isolation of C-V2X VS. 5G



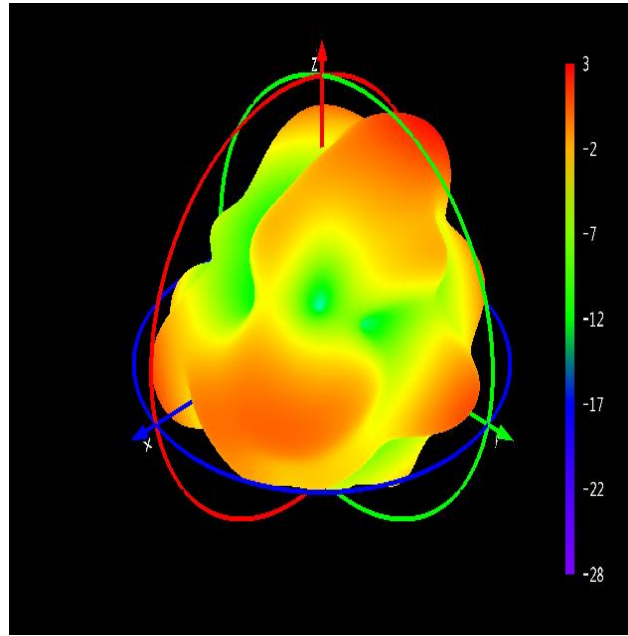
# SharkFin Left Antenna

Gain and Efficiency, C-V2X Antenna

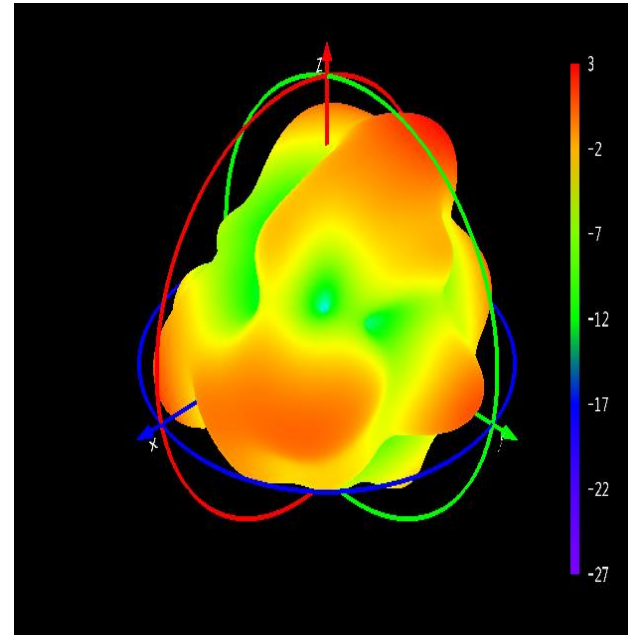
frequency	gain	efficiency	efficiency
频率(MHz)	增益(dBi)	效率(dB)	效率(%)
5850	2.59	-2.17	60.67
5855	2.64	-2.14	61.1
5860	2.81	-2.03	62.63
5865	2.94	-1.94	64.03
5870	2.96	-2.01	62.94
5875	2.84	-2.12	61.37
5880	2.9	-2.06	62.26
5885	2.85	-2.07	62.04
5890	2.67	-2.2	60.21
5895	2.68	-2.13	61.24
5900	2.58	-2.11	61.58
5905	3.14	-2.36	58.06
5910	3.68	-2.58	55.26
5915	3.61	-2.67	54.04
5920	3.65	-2.7	53.67
5925	3.64	-2.68	53.96
5930	3.58	-2.73	53.37

# SharkFin Left Antenna

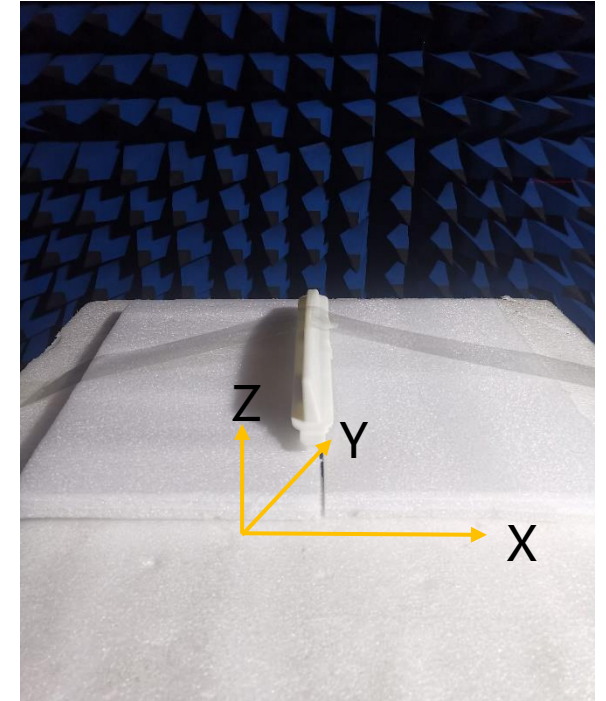
3D Pattern, C-V2X Antenna



5850MHz

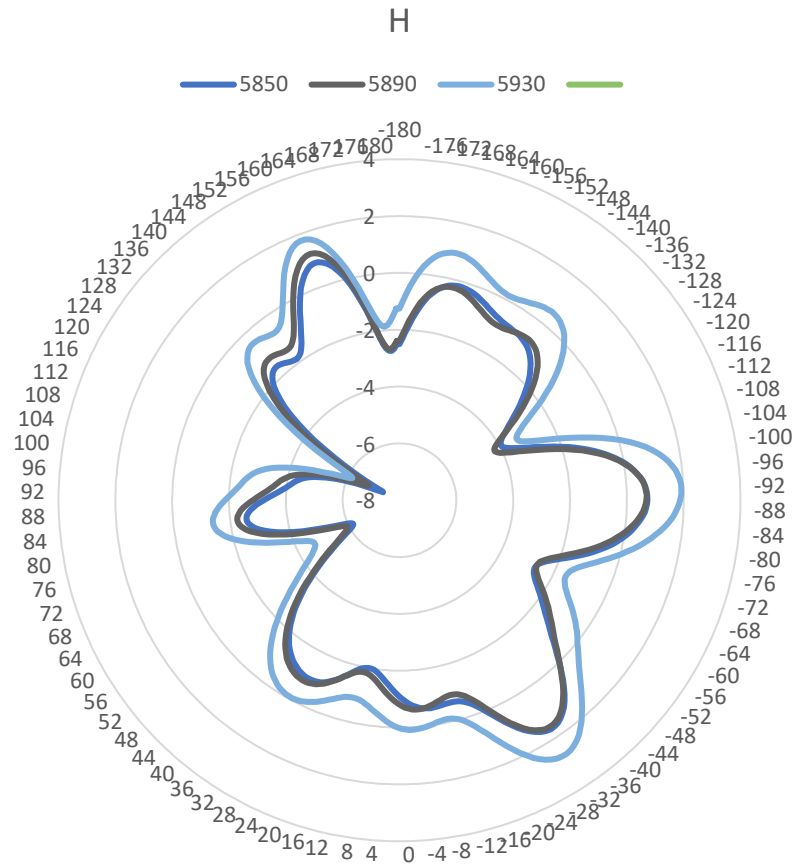


5890MHz



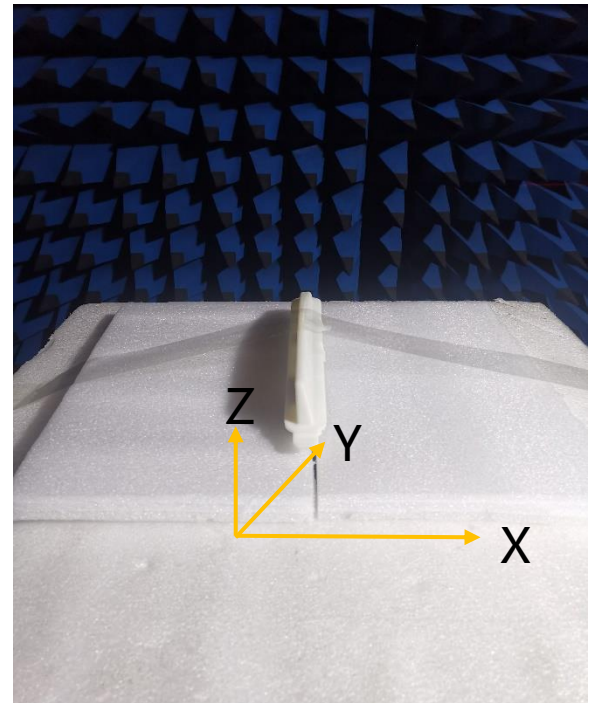
# SharkFin Left Antenna

## 2D Pattern, C-V2X Antenna



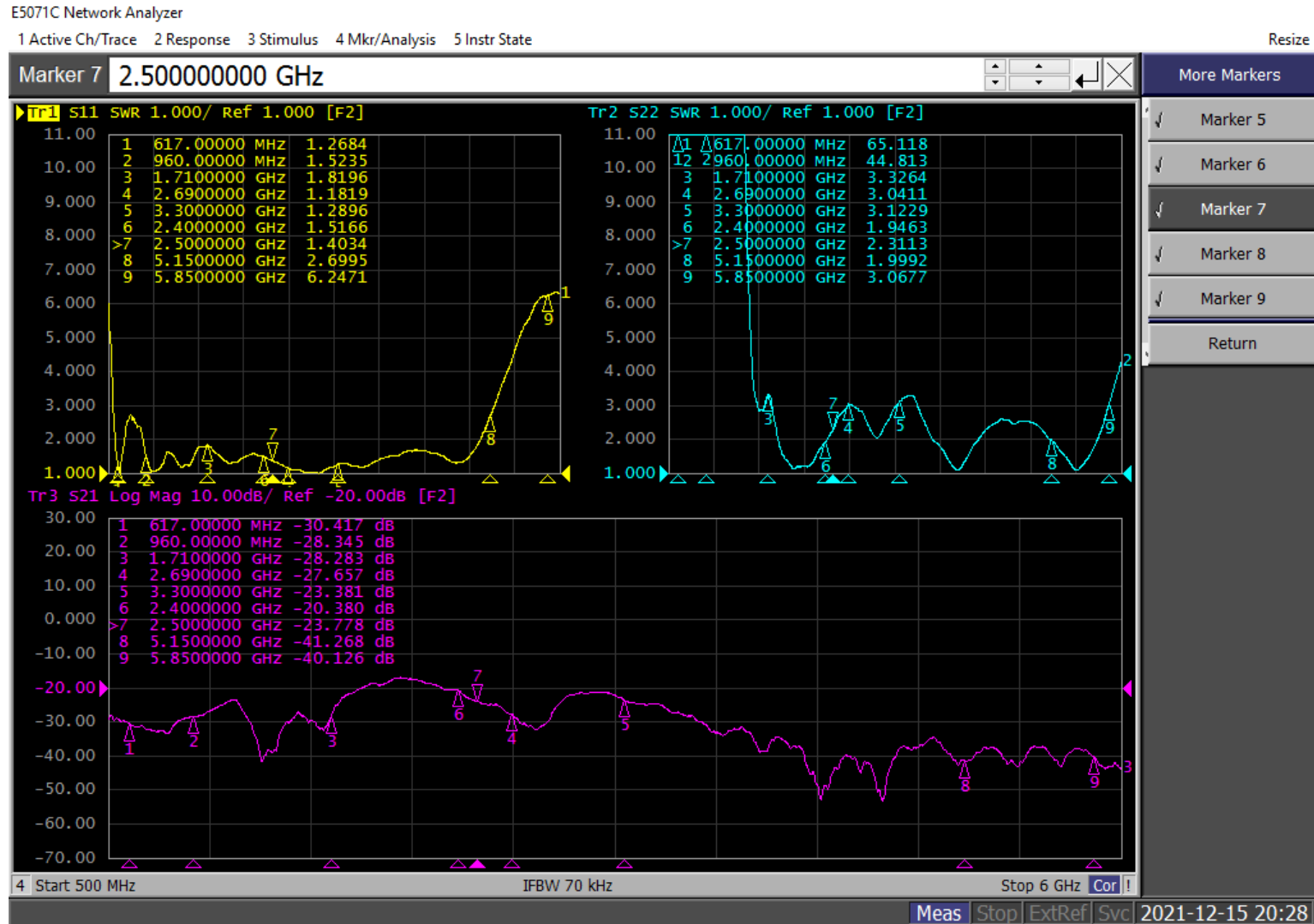
Tailstock(车尾)

Headstock(车头)



# SharkFin Left Antenna

## VSWR of WIFI Antenna , Isolation of WIFI VS. 5G MAIN



# SharkFin Left Antenna

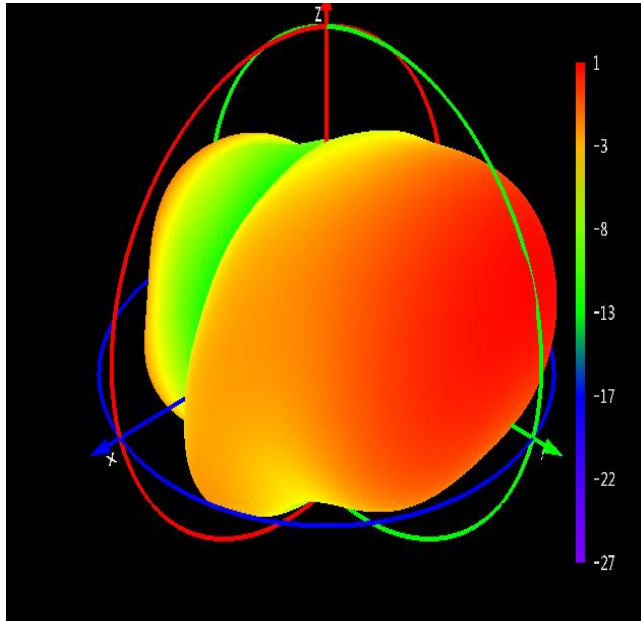
## Gain and Efficiency, WIFI Antenna

frequency 频率(MHz)	gain 增益(dBi)	efficiency 效率(dB)	efficiency 效率(%)
2400	0.98	-3.43	45.44
2410	1.27	-3.22	47.67
2420	0.99	-3.53	44.39
2430	0.86	-3.7	42.62
2440	1.13	-3.48	44.83
2450	0.91	-3.71	42.61
2460	1.07	-3.54	44.24
2470	1.44	-3.18	48.09
2480	1.48	-3.06	49.46
2490	1.33	-3.14	48.58
2500	1.64	-2.81	52.36
5150	4.18	-0.89	81.55
5200	3.77	-1.33	73.61
5250	3.83	-1.32	73.73
5300	3.89	-1.04	78.68
5350	3.84	-1.34	73.49
5400	4.11	-0.97	80.04
5450	3.61	-1.25	74.99
5500	3.31	-1.69	67.81
5550	3.68	-1.33	73.66
5600	3.65	-1.45	71.59
5650	2.92	-2.11	61.52
5700	3.31	-1.79	66.26
5750	3.04	-1.98	63.46
5800	1.95	-2.97	50.47

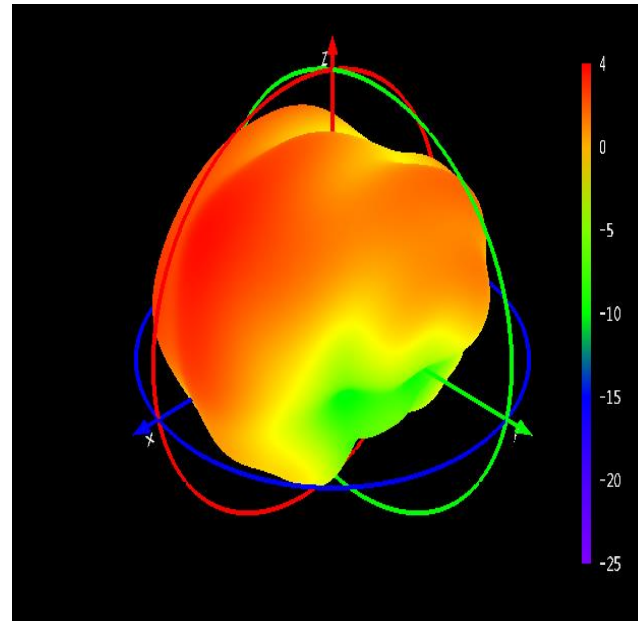


# SharkFin Left Antenna

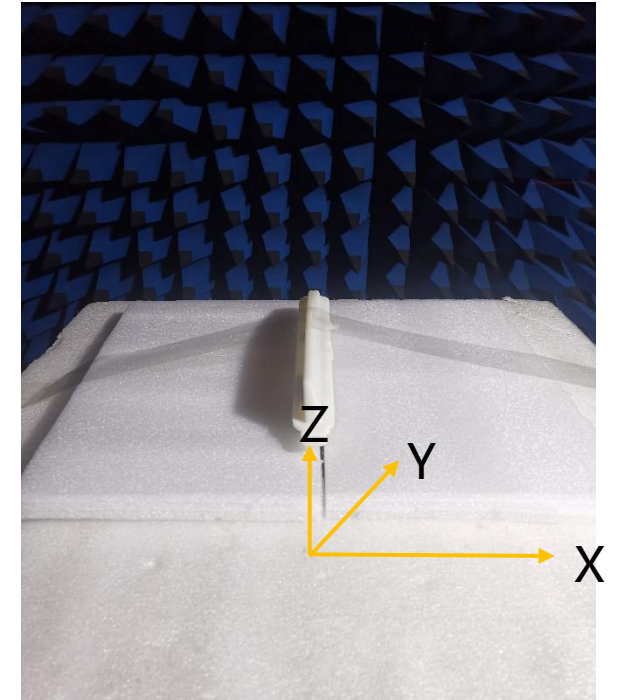
3D Pattern, WIFI Antenna



2450MHz



5550MHz





# SharkFin Left Antenna

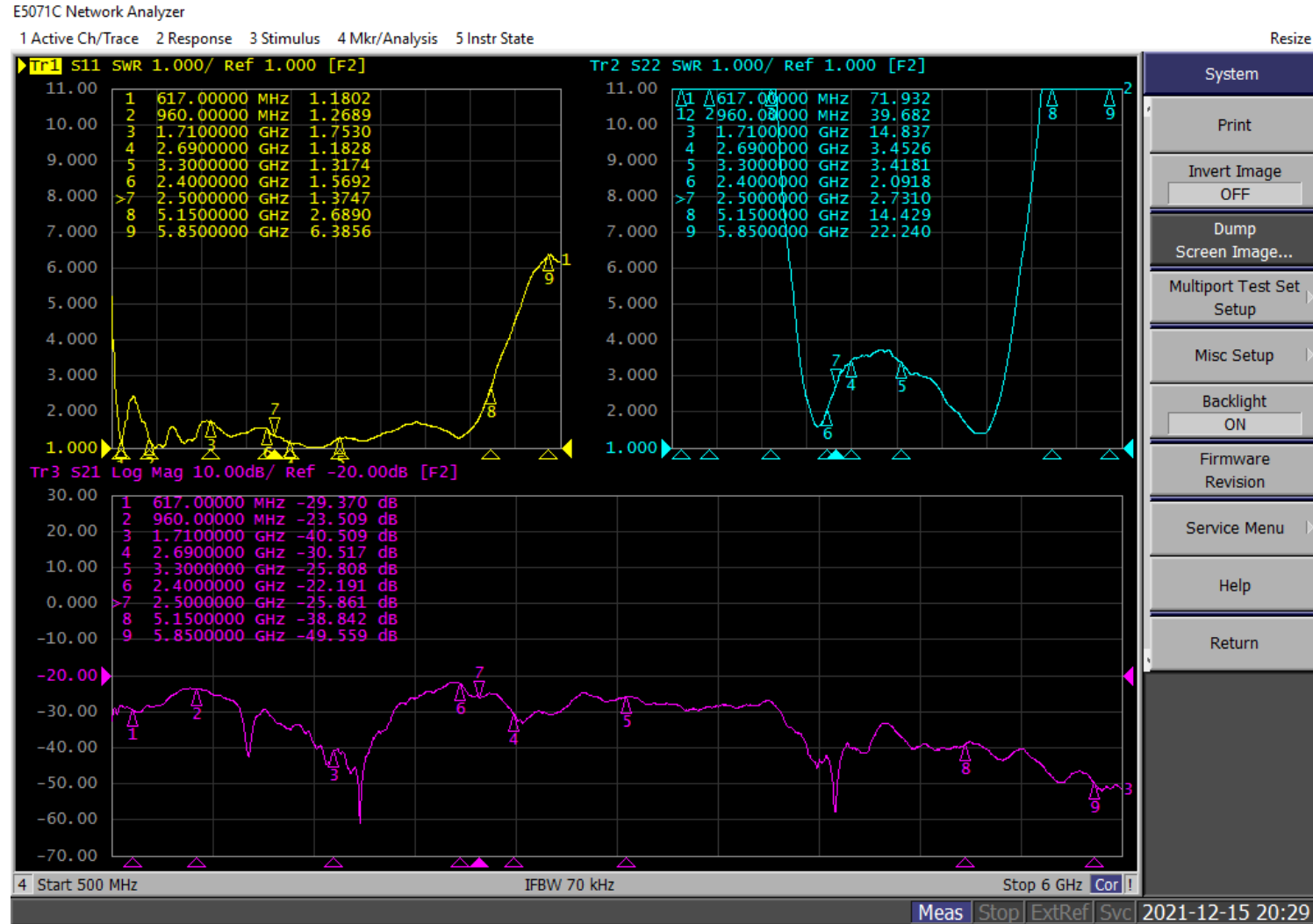
## Gain and Efficiency, 5G MIMO Antenna

frequency	gain	efficiency	efficiency
频率(MHz)	增益(dBi)	效率(dB)	效率(%)
3350	2.11	-1.76	66.76
3400	1.83	-1.82	65.76
3450	1.83	-1.74	66.98
3500	1.38	-2	63.17
3550	1.15	-2.18	60.5
3600	0.84	-2.22	60.03
3650	1.43	-1.84	65.5
3700	0.89	-2.12	61.33
3750	0.8	-2.5	56.21
3800	1.27	-2.04	62.55
3850	0.73	-2.78	52.67
3900	0.7	-2.95	50.69
3950	0.74	-2.83	52.15
4000	0.81	-2.32	58.62
4050	0.1	-2.85	51.93
4100	0.15	-2.83	52.16

frequency	gain	efficiency	efficiency
频率(MHz)	增益(dBi)	效率(dB)	效率(%)
4150	0.56	-2.62	54.64
4200	0.9	-2.58	55.26
4250	0.17	-3.29	46.84
4300	1.32	-2.01	62.96
4350	1.79	-1.89	64.76
4400	1.79	-2.12	61.37
4450	3.28	-1.45	71.59
4500	3.42	-1.6	69.11
4550	3.85	-1.3	74.07
4600	3.97	-1.34	73.46
4650	4.59	-0.83	82.69
4700	4.39	-1.23	75.33
4750	4.39	-1.16	76.64
4800	4.54	-1.26	74.84
4850	4.28	-1.41	72.21
4900	5.28	-1.13	77.05
4950	5.14	-1.21	75.68
5000	4.82	-1.52	70.44

# SharkFin Left Antenna

## VSWR of BT Antenna , Isolation of BT VS. 5G MAIN



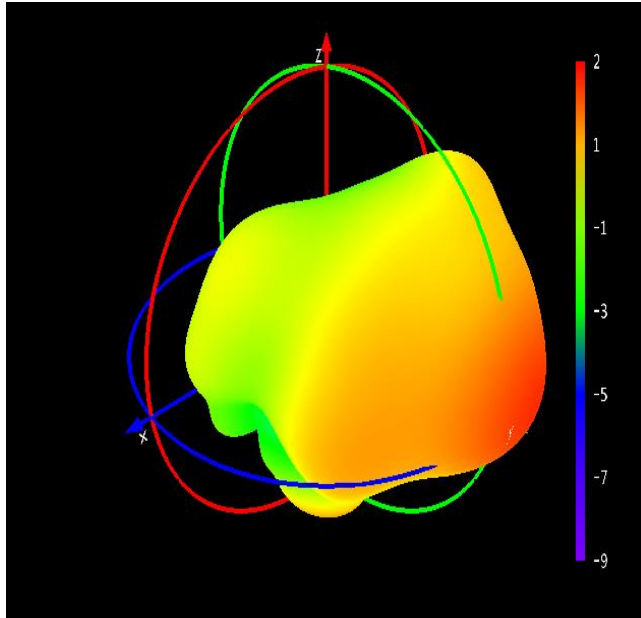
# SharkFin Left Antenna

Gain and Efficiency, BT Antenna

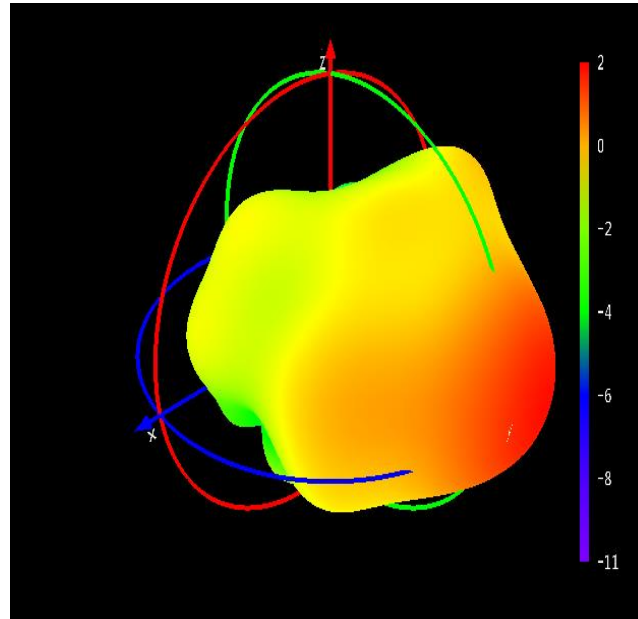
frequency 频率(MHz)	gain 增益(dBi)	efficiency 效率(dB)	efficiency 效率(%)
2400	1.57	-2.34	58.32
2410	1.36	-2.54	55.72
2420	1.13	-2.73	53.32
2430	1.25	-2.63	54.55
2440	1.07	-2.77	52.87
2450	1.01	-2.81	52.35
2460	1.41	-2.49	56.36
2470	1.45	-2.61	54.79
2480	1.47	-2.73	53.3
2490	2.11	-2.26	59.41
2500	1.85	-2.7	53.72

# SharkFin Left Antenna

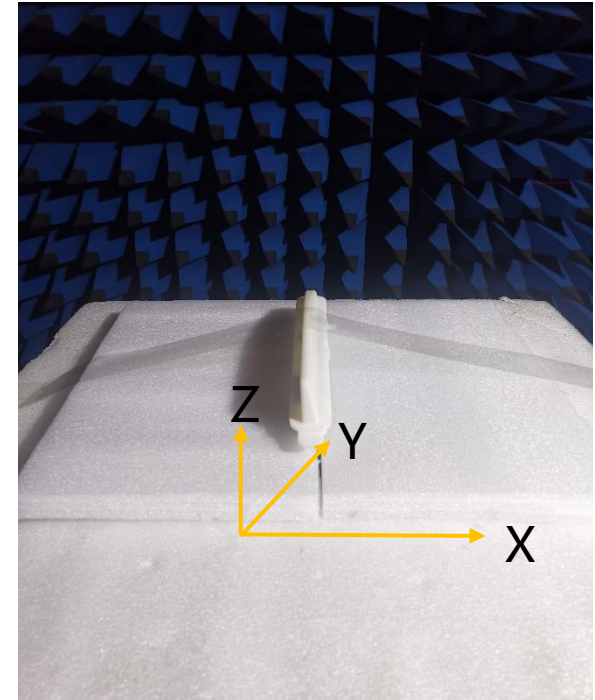
3D Pattern, BT Antenna



2400MHz

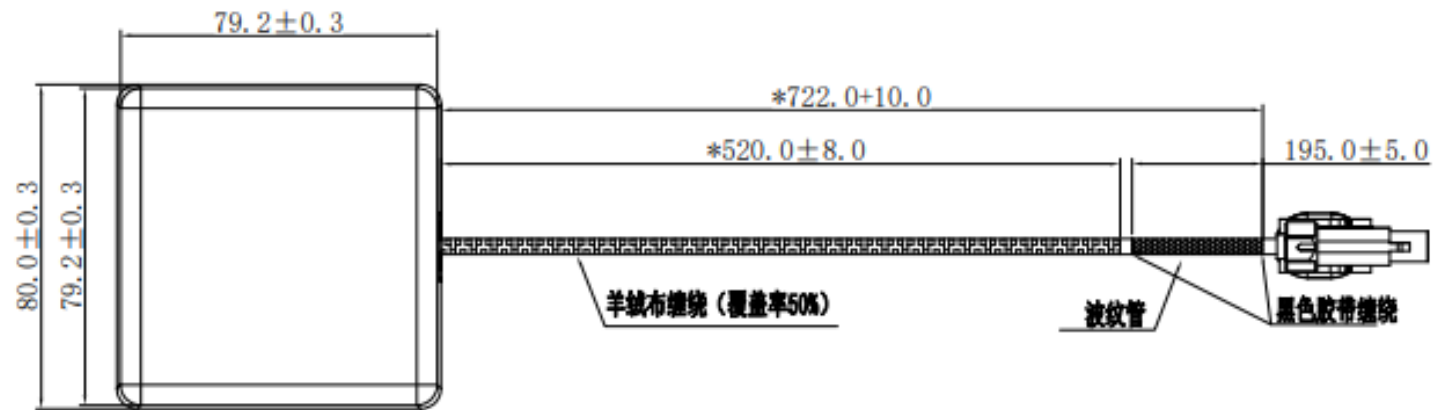


2500MHz



# GNSS Active Antenna

## 2D Dimension

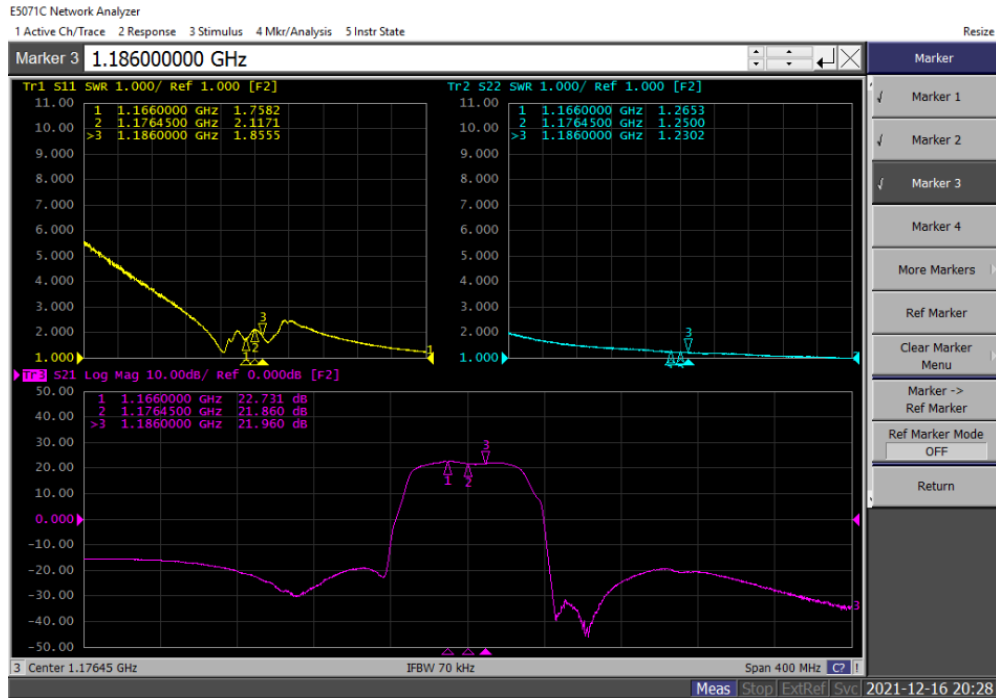


FAKRA: Rosenberger: 59S14J-1M4T4-C

卡扣: Rosenberger: TA-CCOVAL2

# GNSS Active Antenna

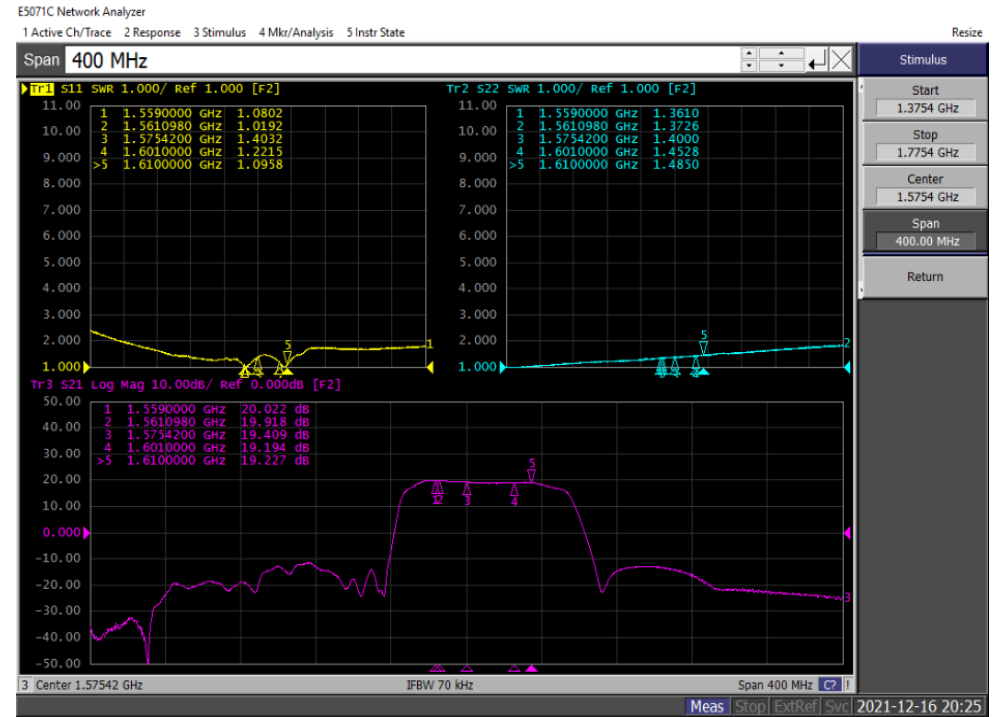
## Gain Output VSWR, GNSS LNA



L5:1166-1186MHz

Gain: 21.8-22.7dB

Output VSWR:1.23-1.26



L1:1559-1610MHz

Gain: 19.1-20.0dB

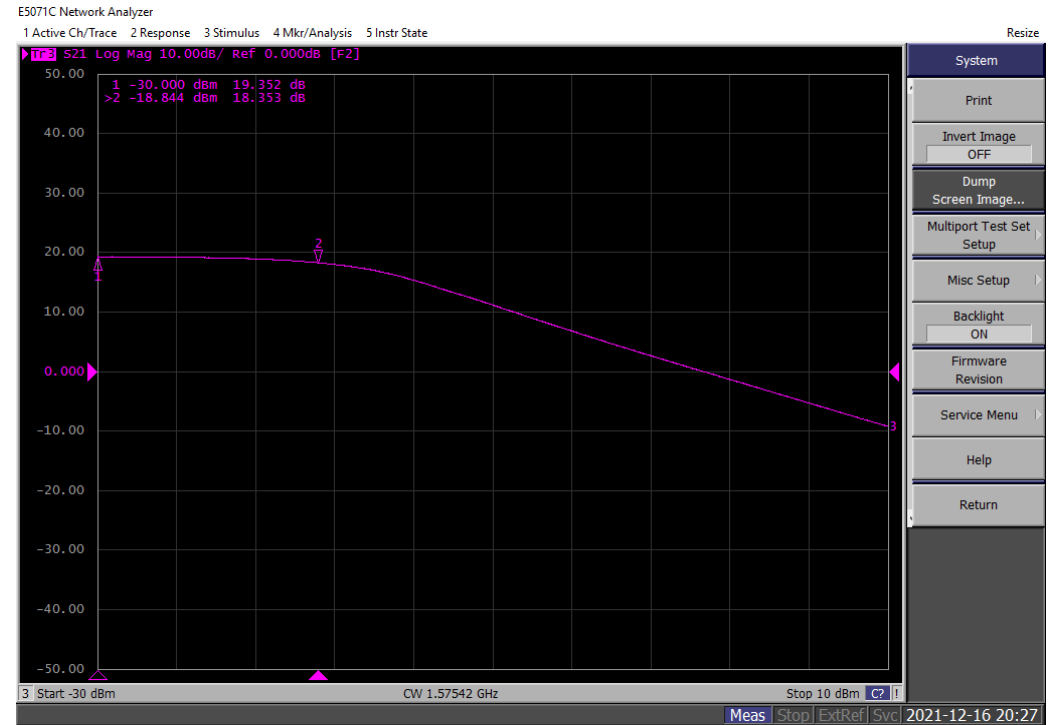
Output VSWR:1.37-1.48

# GNSS Active Antenna

## P1dB, GNSS LNA



L5  
P1dB:-20.9dBm



L1  
P1dB:-18.8dBm

# GNSS Active Antenna

Working Current, GNSS LNA

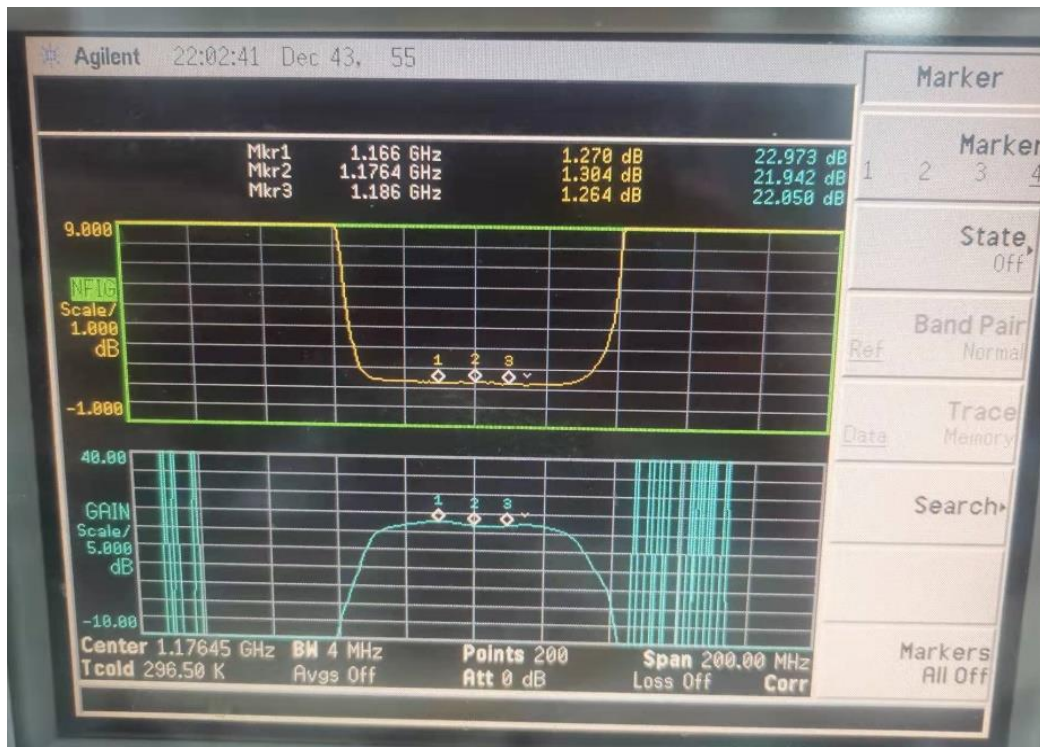


63mA@3.3V

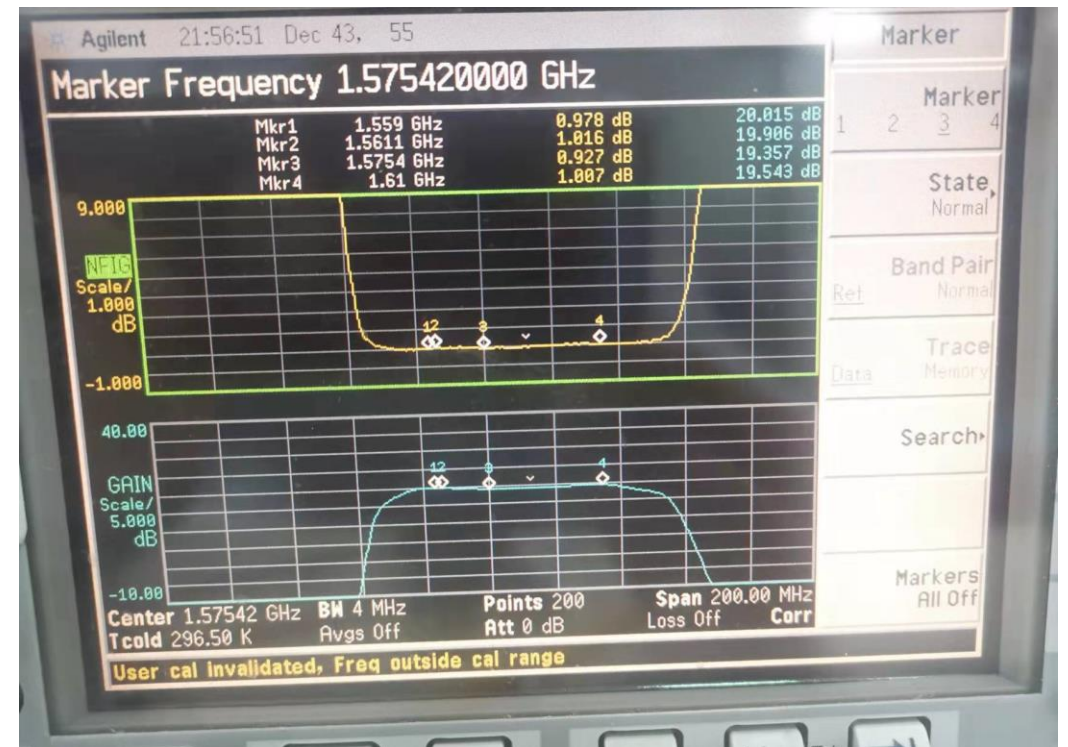


# GNSS Active Antenna

## NF, GNSS LNA



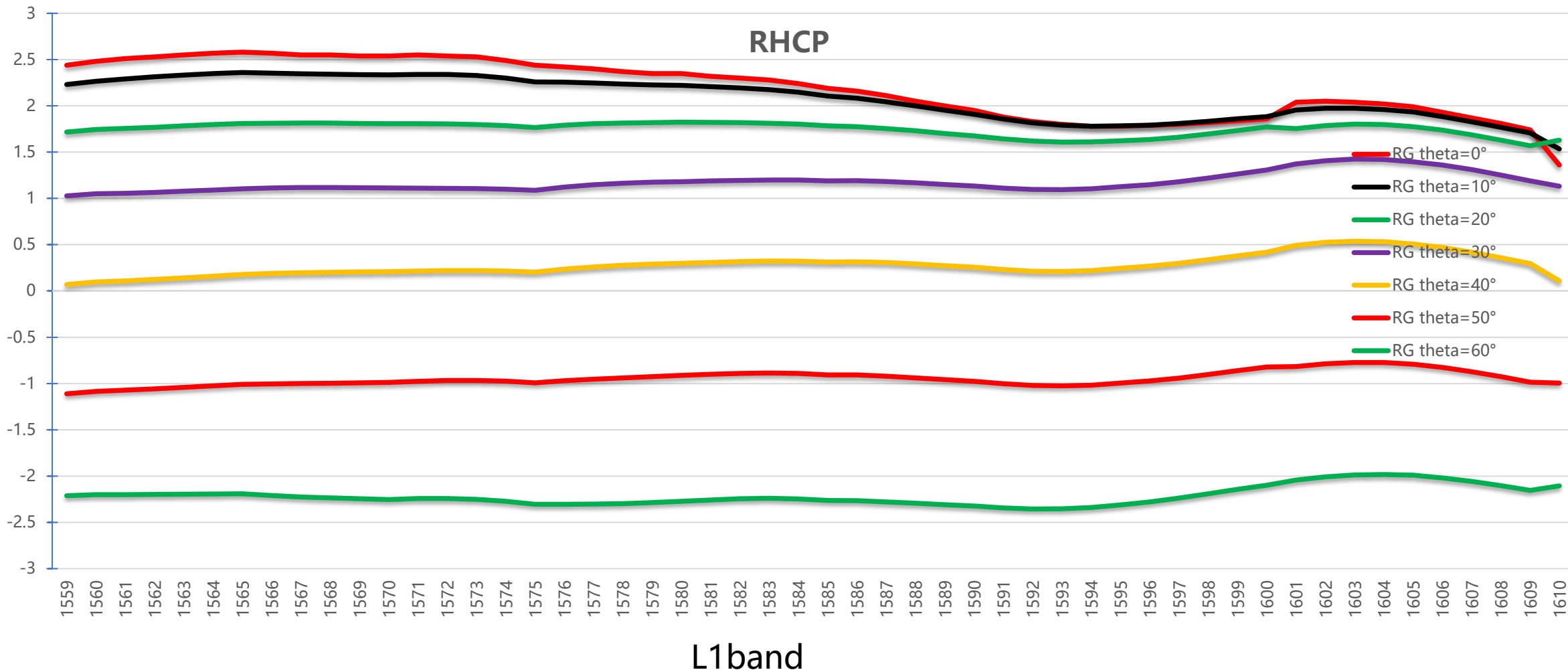
L5: 1.27-1.30



L1: 0.97-1.01

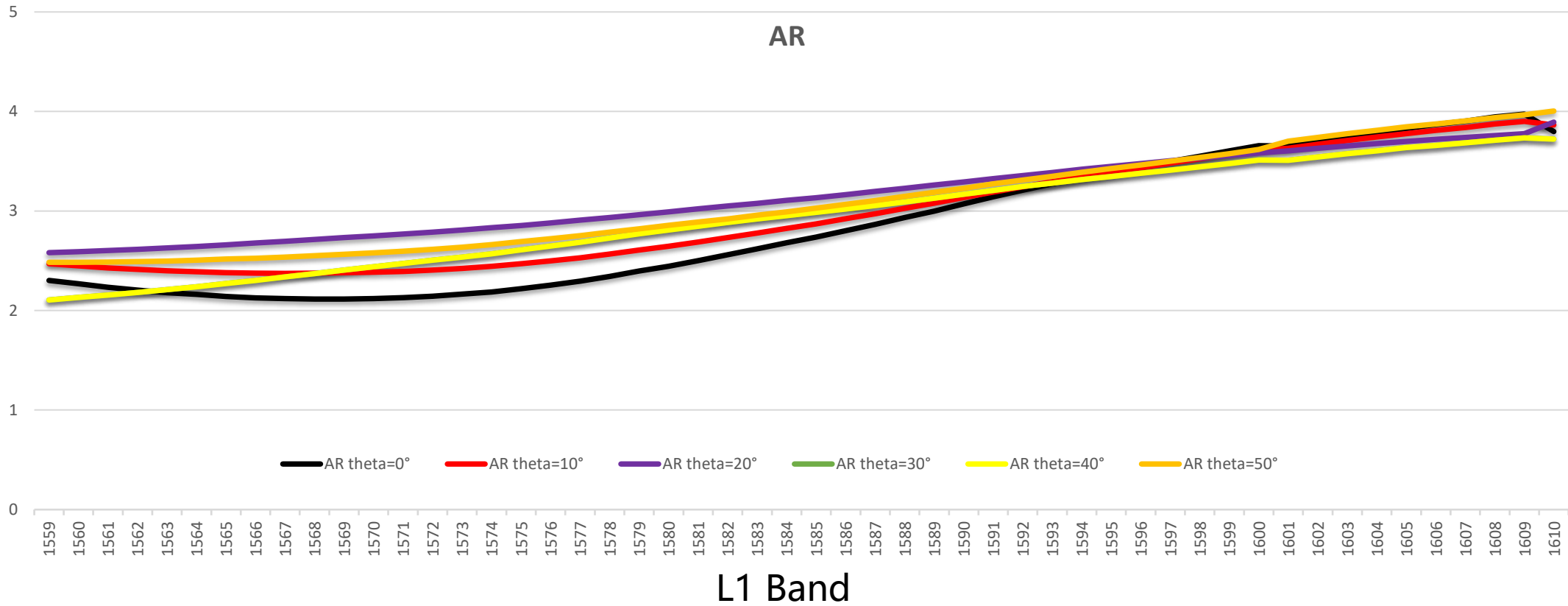
# GNSS Active Antenna

Antenna RHCP, GNSS Antenna L1 Band



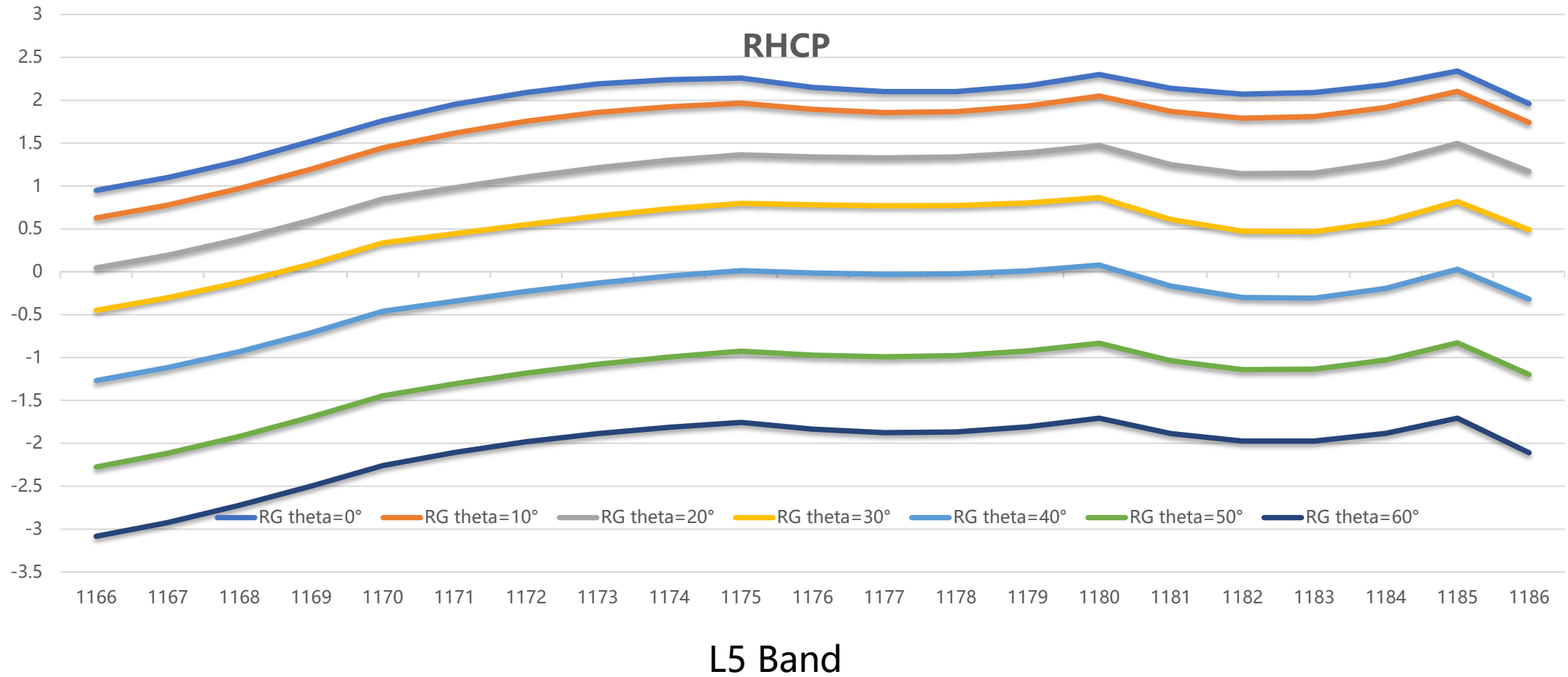
# GNSS Active Antenna

Antenna AR , GNSS Antenna L1 Band



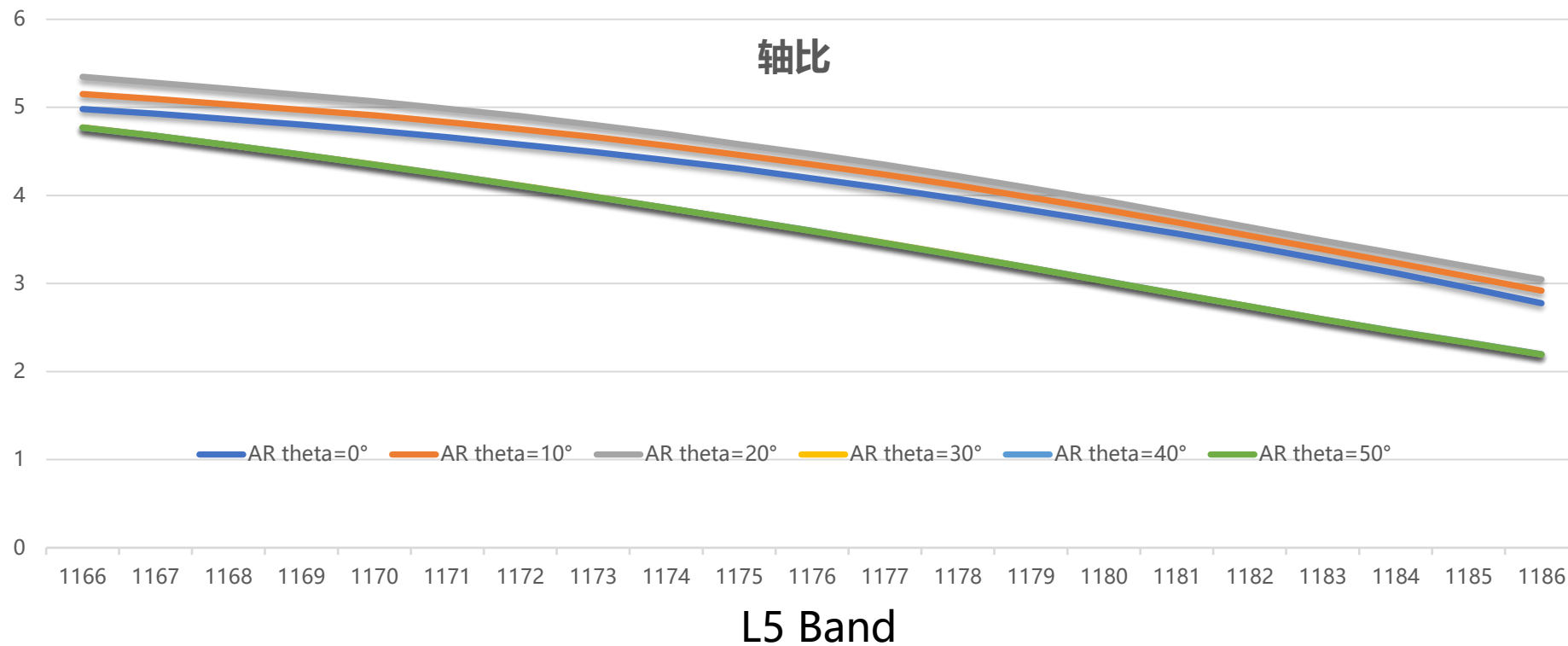
# GNSS Active Antenna

Antenna RHCP, GNSS Antenna L5 Band



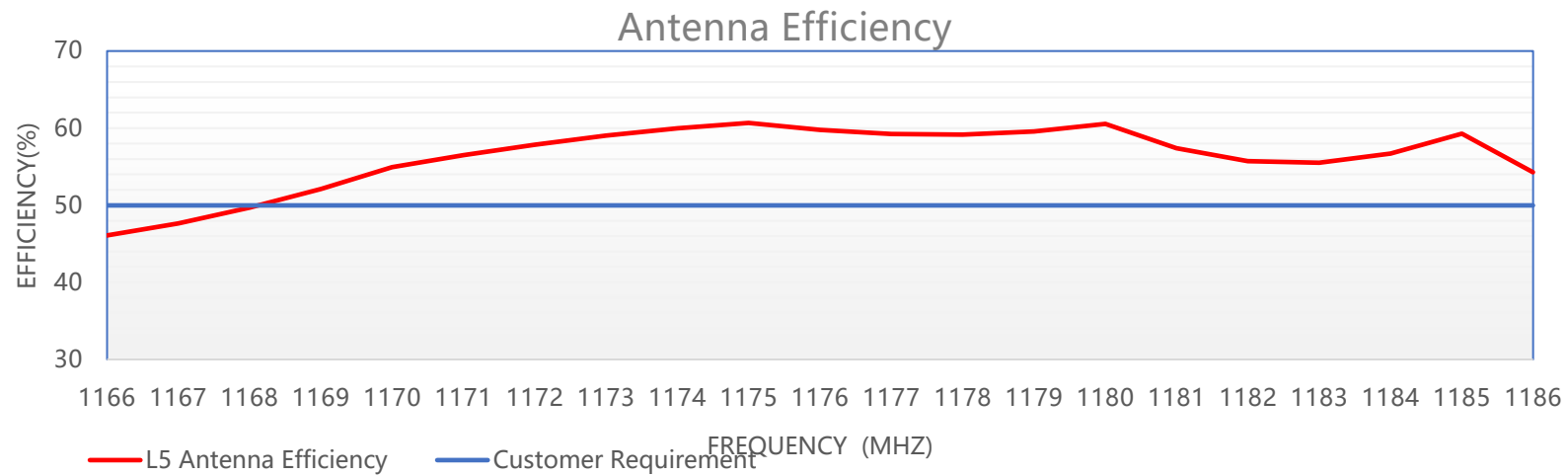
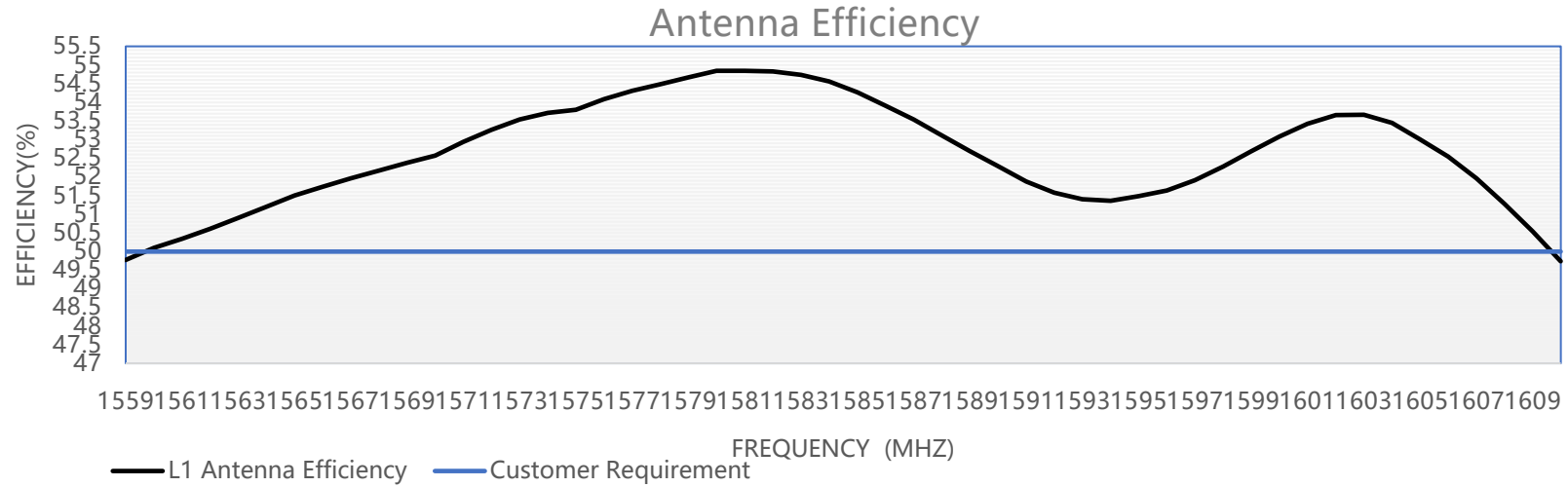
# GNSS Active Antenna

Antenna AR , GNSS Antenna L5 Band



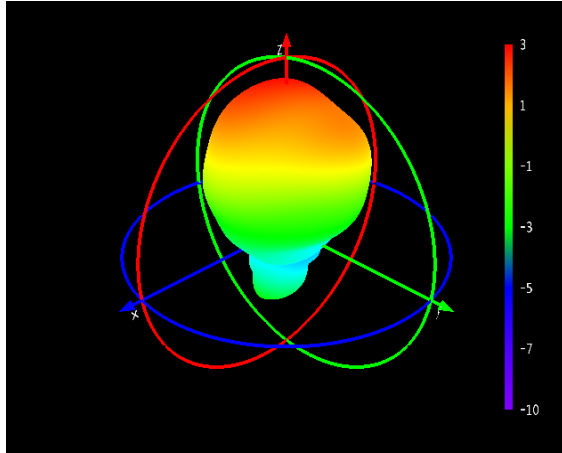
# GNSS Active Antenna

## GNSS Antenna Efficiency

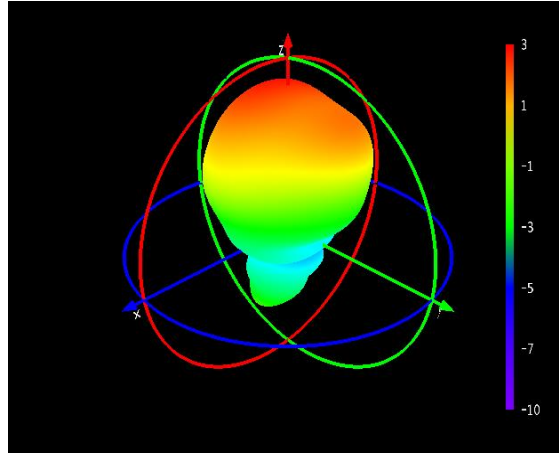


# GNSS Active Antenna

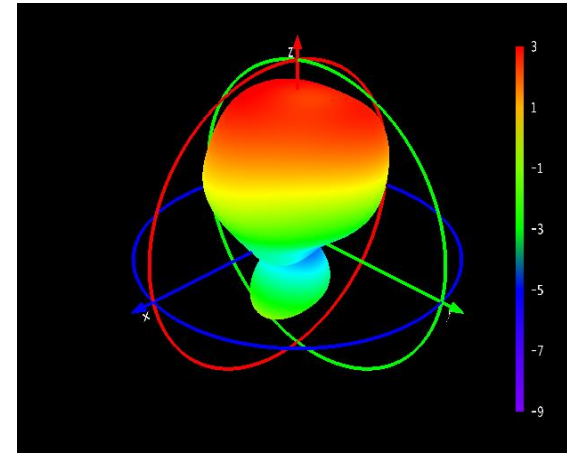
## 3D Pattern



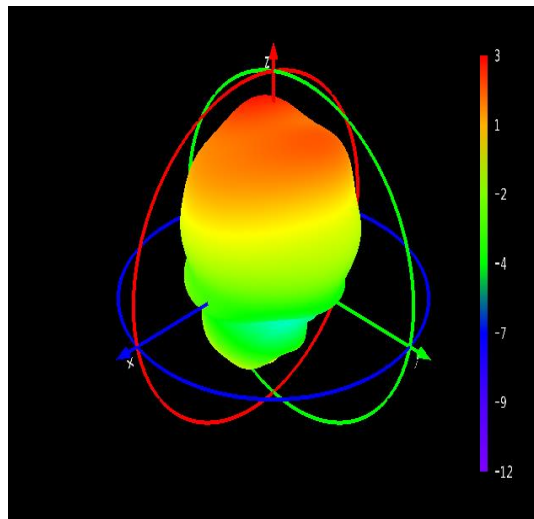
1561MHz



1575MHz



1610MHz



1176MHz

