



# FEV-212F

## Antenna Test Report



**Senao Networks, Inc.**

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**Project  
Description**

**Sub6G antenna  
GPS antenna**

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**Date**

**2022/10/07**

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**Prepared by**

**Tony**

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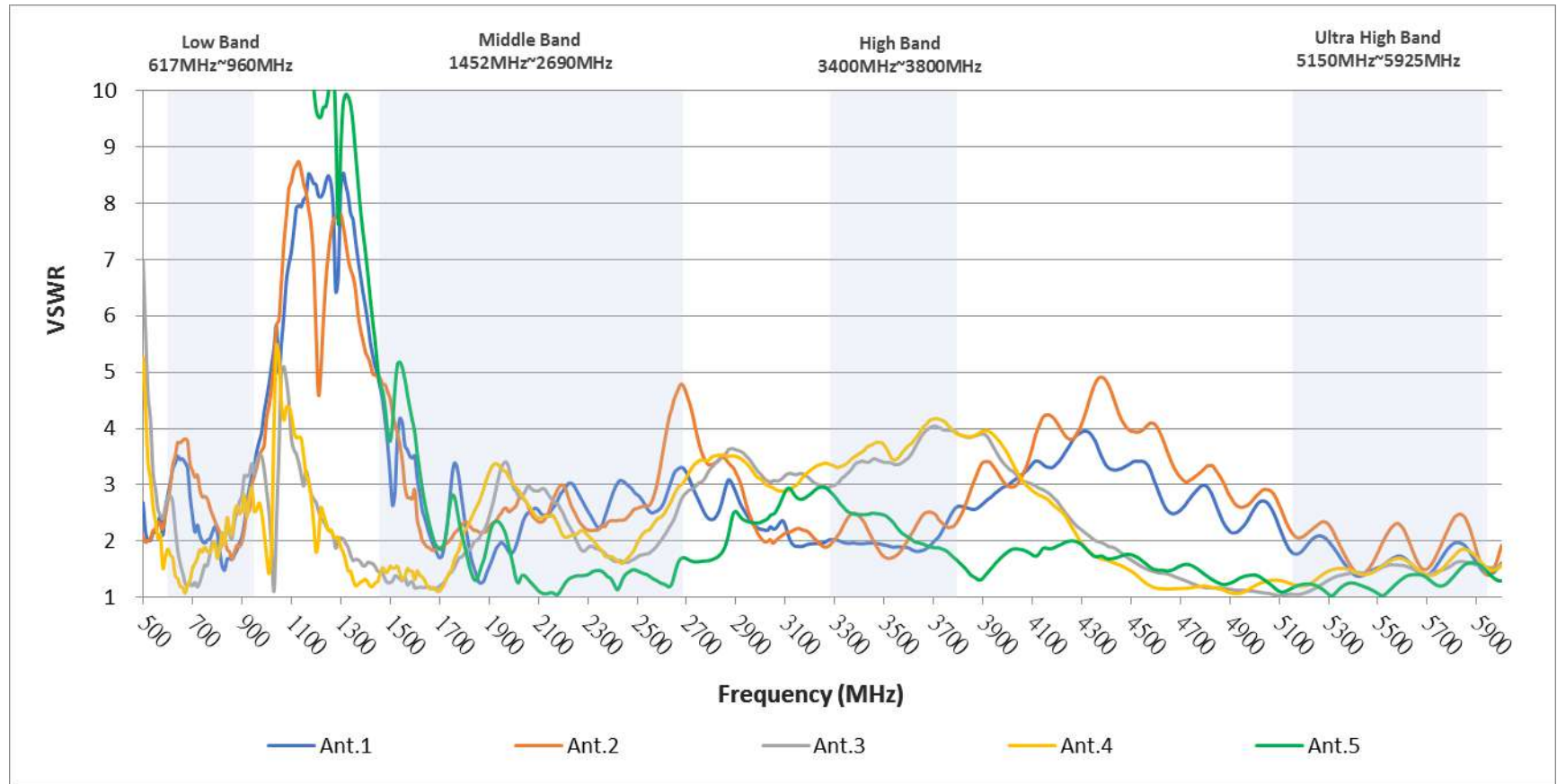
**Report Version**

**A04**

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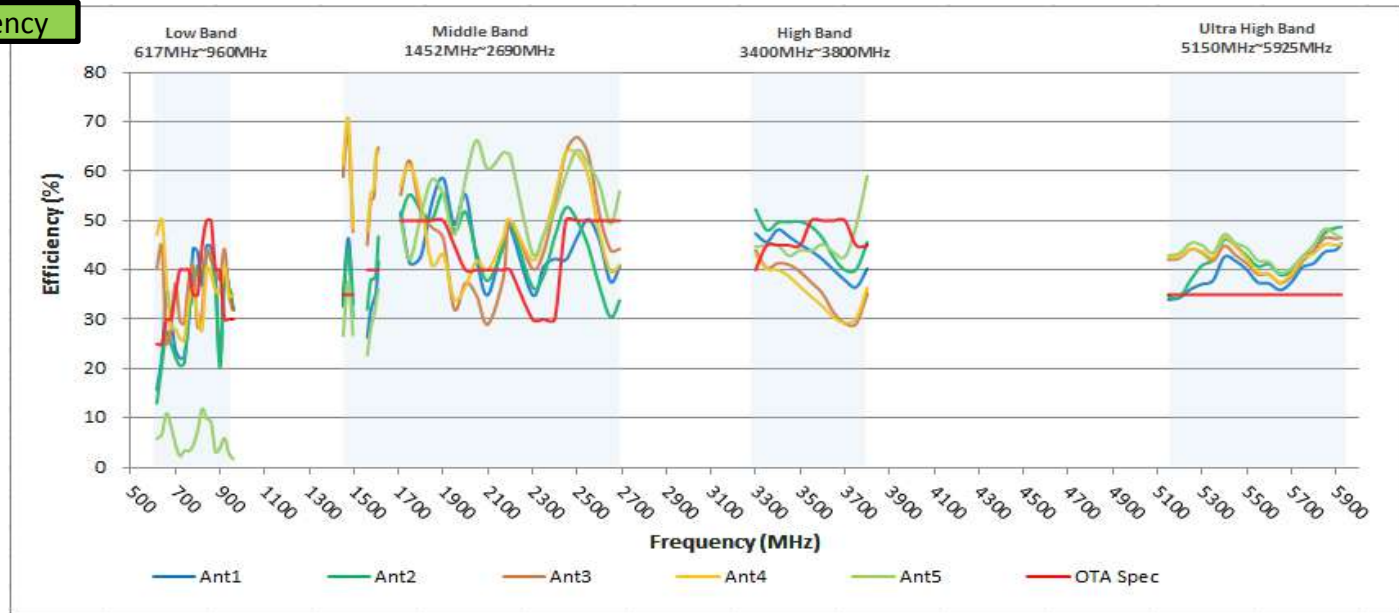
**5 in 1, cable 0.3M**

**Antenna type : PIFA**

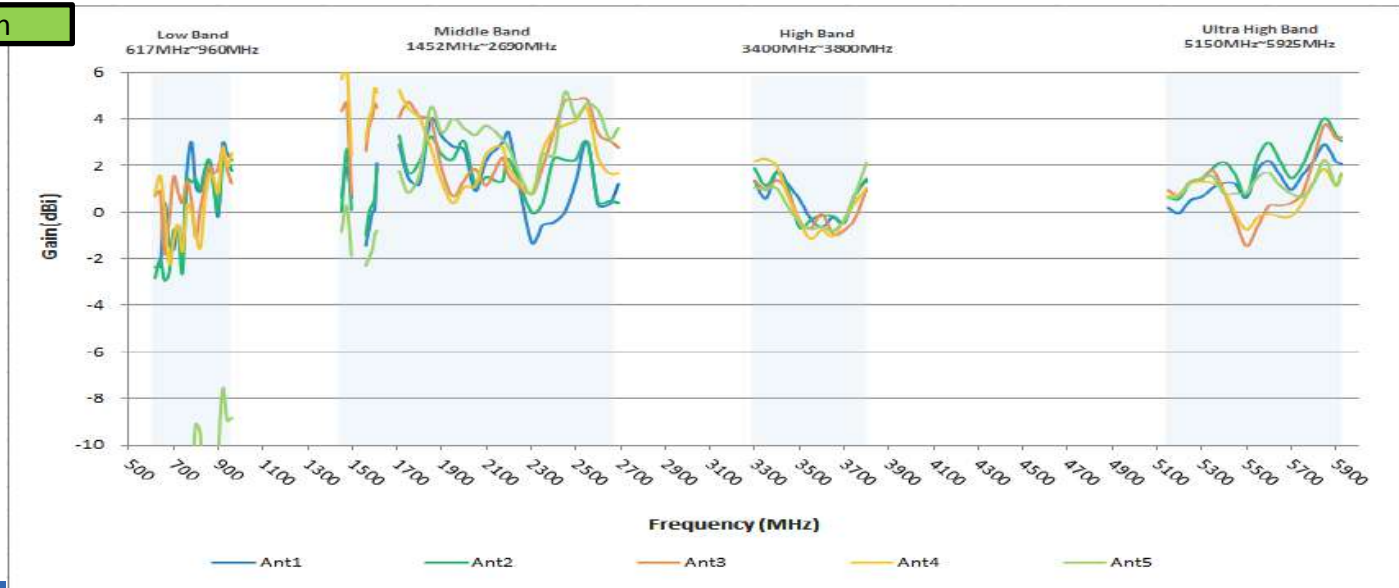


# Antenna Efficiency and Gain – Free Space

## Efficiency



## Gain



# Antenna Efficiency and Gain – Free Space

	Ant1		Ant2		Ant3		Ant4		Ant5	
Freq. (MHz)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)
617	15.78	-2.34	12.99	-2.84	40.26	0.68	47.15	0.82	5.77	-10.29
640	22.68	-2.36	20.91	-2.05	44.70	0.90	50.07	1.54	6.82	-11.50
660	35.43	0.38	27.32	-2.96	25.24	-1.78	37.99	0.09	10.92	-13.80
680	30.15	-1.29	25.10	-2.63	28.05	-0.36	28.46	-2.22	8.42	-15.69
700	23.86	-1.63	22.36	-0.80	37.26	1.50	28.06	-1.19	4.71	-19.92
720	22.12	-0.56	20.61	-0.76	29.79	0.87	26.09	-0.53	2.29	-18.72
740	22.42	-1.69	21.07	-2.62	29.19	0.42	25.77	-1.70	3.39	-15.70
760	29.88	1.80	31.36	1.42	37.93	1.33	33.18	0.33	3.33	-13.70
780	44.33	3.03	34.99	1.27	40.85	0.49	36.35	0.03	4.43	-11.63
800	43.59	1.05	40.87	1.41	28.45	-1.11	30.42	-0.96	7.49	-9.09
820	36.82	0.89	39.09	0.96	31.50	0.18	27.92	-1.54	11.84	-9.55
840	44.87	1.83	43.22	1.76	43.93	1.06	40.50	0.49	9.90	-14.71
860	44.61	2.22	42.25	2.25	42.14	1.93	39.05	1.60	9.18	-16.94
880	38.54	1.25	37.32	0.98	40.31	1.66	35.85	1.41	3.15	-17.40
900	21.55	-0.19	20.18	0.07	38.12	1.91	35.32	0.87	3.94	-10.62
920	40.05	2.97	39.19	2.14	44.24	2.57	40.66	2.79	5.94	-7.59
940	36.26	2.51	36.64	2.17	35.06	1.80	34.68	1.95	2.82	-8.95
960	31.88	2.25	32.14	1.79	31.80	1.22	35.15	2.52	1.66	-8.86
1452	33.64	0.64	32.67	0.02	58.92	4.33	61.27	5.70	26.68	-0.83
1475	46.43	1.93	44.39	2.72	67.89	4.68	70.66	6.27	37.68	0.25
1496	33.12	0.63	30.30	0.10	47.74	0.72	48.42	2.42	26.82	-1.86
1560	26.33	-1.43	31.99	-0.99	45.08	2.63	47.89	3.16	22.72	-2.30
1575	31.66	-0.72	37.85	-0.02	53.84	3.68	55.27	4.02	27.98	-1.96
1590	33.84	0.03	38.21	0.33	54.88	4.09	56.64	4.48	30.70	-1.58
1600	35.69	0.09	39.39	0.61	62.94	4.64	64.05	5.33	33.63	-0.96
1610	41.80	2.10	46.79	1.88	64.80	4.51	63.66	5.12	36.15	-0.80

# Antenna Efficiency and Gain – Free Space

	Ant1		Ant2		Ant3		Ant4		Ant5	
Freq. (MHz)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)
1710	51.65	2.88	50.80	3.29	55.21	4.10	56.93	5.22	50.23	1.77
1750	41.43	1.47	55.31	1.69	62.15	4.72	61.30	4.45	42.07	0.84
1800	42.79	1.20	52.06	2.17	51.55	4.11	53.52	4.03	51.13	1.61
1850	53.73	3.97	50.29	3.25	48.59	3.98	40.97	2.81	58.34	4.50
1900	58.58	3.26	55.47	2.46	46.47	1.85	43.17	1.30	55.31	3.40
1950	49.23	2.82	47.85	2.28	32.05	0.68	34.09	0.39	47.18	4.01
2000	55.30	2.68	51.80	3.06	37.35	1.37	36.70	1.07	58.39	3.60
2050	42.27	0.92	43.31	1.20	34.78	1.86	41.80	1.13	66.28	3.31
2100	34.92	2.24	37.81	1.50	28.95	1.14	39.93	2.51	60.45	3.72
2170	45.96	2.95	44.73	1.32	38.44	2.33	46.55	2.82	63.80	3.15
2200	48.58	3.39	49.68	2.27	49.87	1.56	50.17	1.92	63.19	2.76
2300	34.96	-1.26	36.50	0.02	40.27	0.80	41.99	0.84	43.37	0.73
2350	40.62	-0.57	38.82	0.35	43.59	1.90	47.04	2.61	47.10	2.47
2400	42.22	-0.44	46.71	2.28	53.13	3.41	54.99	3.49	52.27	2.43
2450	42.08	-0.01	52.64	2.26	63.92	4.77	63.88	3.73	59.10	5.14
2500	46.56	1.32	50.09	2.27	66.92	4.83	63.58	3.91	64.30	4.10
2550	50.27	3.05	44.74	3.02	63.41	4.85	59.00	4.44	61.44	4.67
2600	46.11	0.30	36.70	0.43	51.31	3.36	47.43	2.31	57.27	4.36
2650	37.59	0.34	30.41	0.48	44.00	3.08	39.79	1.66	49.36	3.17
2690	40.77	1.20	33.81	0.41	44.30	2.77	41.07	1.66	55.96	3.63
3300	47.38	1.36	52.27	1.88	44.05	1.36	43.13	2.17	44.76	1.05
3350	45.70	0.58	48.07	1.12	40.42	0.96	40.24	2.30	44.95	1.01
3400	48.16	1.77	49.62	1.68	41.39	1.38	40.05	1.94	44.95	1.01
3450	46.75	1.18	49.71	0.99	41.06	0.82	38.69	0.66	42.87	0.21
3500	45.16	0.56	49.80	-0.66	39.61	-0.34	36.59	-0.38	43.99	-0.43
3550	43.79	-0.28	48.77	-0.34	37.46	-0.71	34.58	-1.16	43.85	-0.74

# Antenna Efficiency and Gain – Free Space

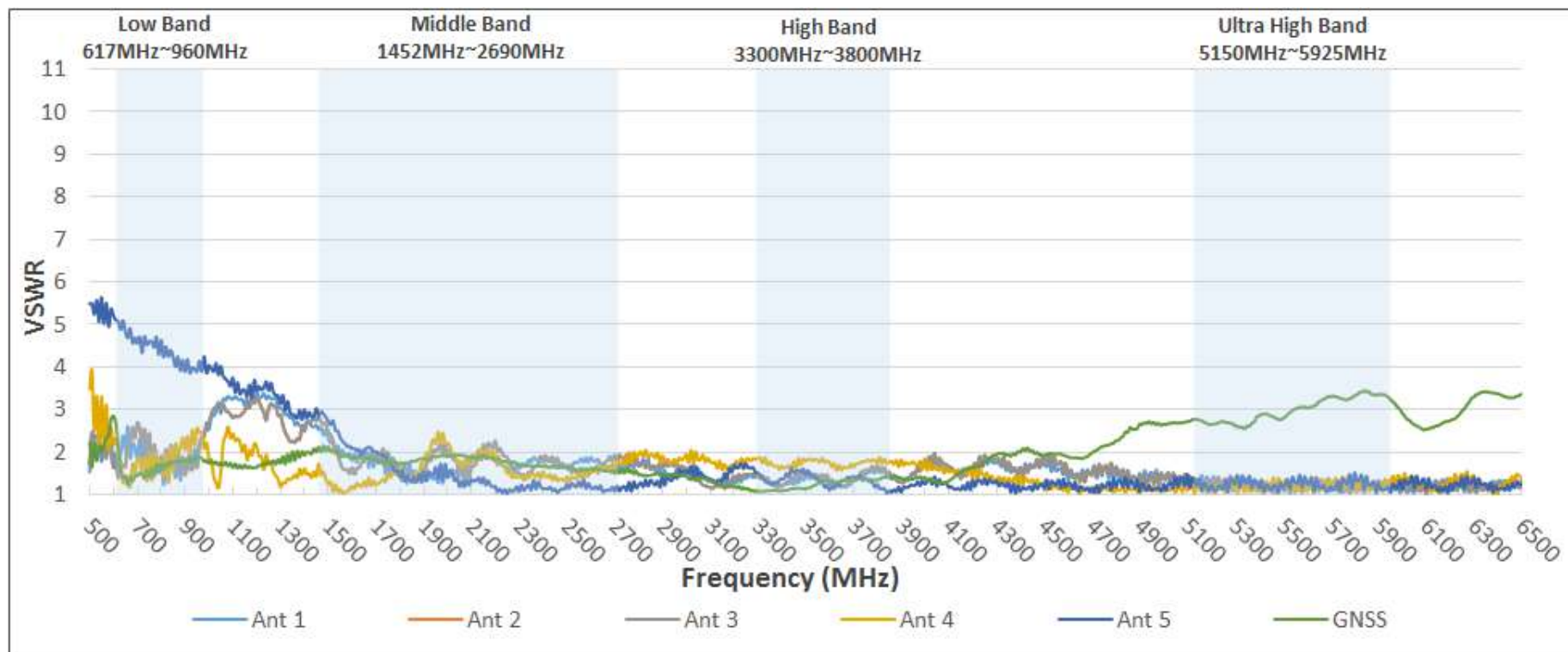
	Ant1		Ant2		Ant3		Ant4		Ant5	
Freq. (MHz)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)
3600	42.16	-0.66	46.44	-0.16	35.22	-0.07	32.64	-0.77	45.21	-0.64
3650	39.97	-0.23	42.48	-0.18	31.34	-0.93	30.33	-1.05	43.53	-0.81
3700	37.95	-0.46	39.99	-0.38	29.21	-0.79	29.28	-0.36	42.70	-0.34
3750	36.50	0.75	40.04	0.79	29.07	-0.26	30.14	0.42	48.82	0.77
3800	40.26	1.33	45.57	1.43	35.19	1.01	36.33	1.03	59.05	2.11
5150	33.98	0.18	34.68	0.65	42.07	0.94	42.50	0.67	42.97	0.59
5200	34.39	-0.03	34.49	0.58	42.39	0.76	42.72	0.81	43.38	0.70
5250	36.13	0.51	38.03	1.29	44.18	1.32	44.25	1.22	45.48	1.28
5300	37.13	0.65	40.90	1.39	43.50	1.44	43.75	1.32	45.00	1.44
5350	37.89	1.05	42.04	1.89	41.89	1.79	42.58	1.23	43.43	1.52
5400	42.66	1.25	46.13	2.15	44.91	0.86	46.63	0.90	47.24	0.81
5450	41.82	1.21	44.90	1.61	42.99	-0.31	44.77	-0.08	45.40	0.82
5500	40.10	0.61	42.88	0.69	41.36	-1.44	42.36	-0.76	44.49	0.83
5550	37.47	1.82	40.75	2.32	39.11	-0.64	39.46	-0.24	41.93	1.49
5600	37.29	2.21	41.15	2.97	39.12	0.25	39.21	-0.08	41.64	1.68
5650	35.92	1.60	39.02	2.21	37.32	0.27	37.47	-0.21	39.31	1.13
5700	37.49	0.96	39.69	1.46	38.68	0.40	39.12	-0.18	40.39	0.81
5750	40.55	1.57	42.70	1.99	41.73	0.78	42.29	0.37	42.75	0.64
5800	41.32	2.18	43.87	3.09	43.84	2.23	43.33	1.29	45.08	1.21
5850	43.65	2.90	47.50	4.04	46.47	3.75	45.22	1.86	48.34	2.26
5900	44.04	2.18	48.54	3.32	46.33	3.19	45.01	1.14	47.10	1.13
5925	45.41	2.07	48.71	3.07	46.51	3.22	45.28	1.67	46.56	1.61

**5 in 1, cable 5M**

**Antenna type : PIFA**

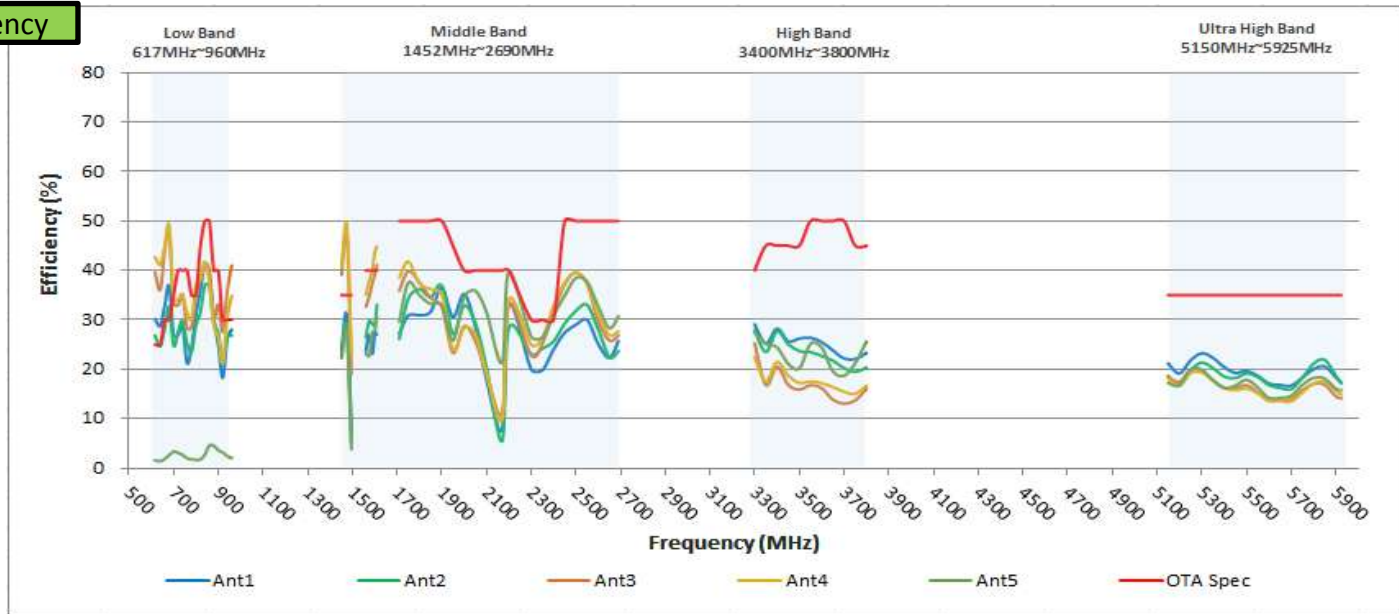




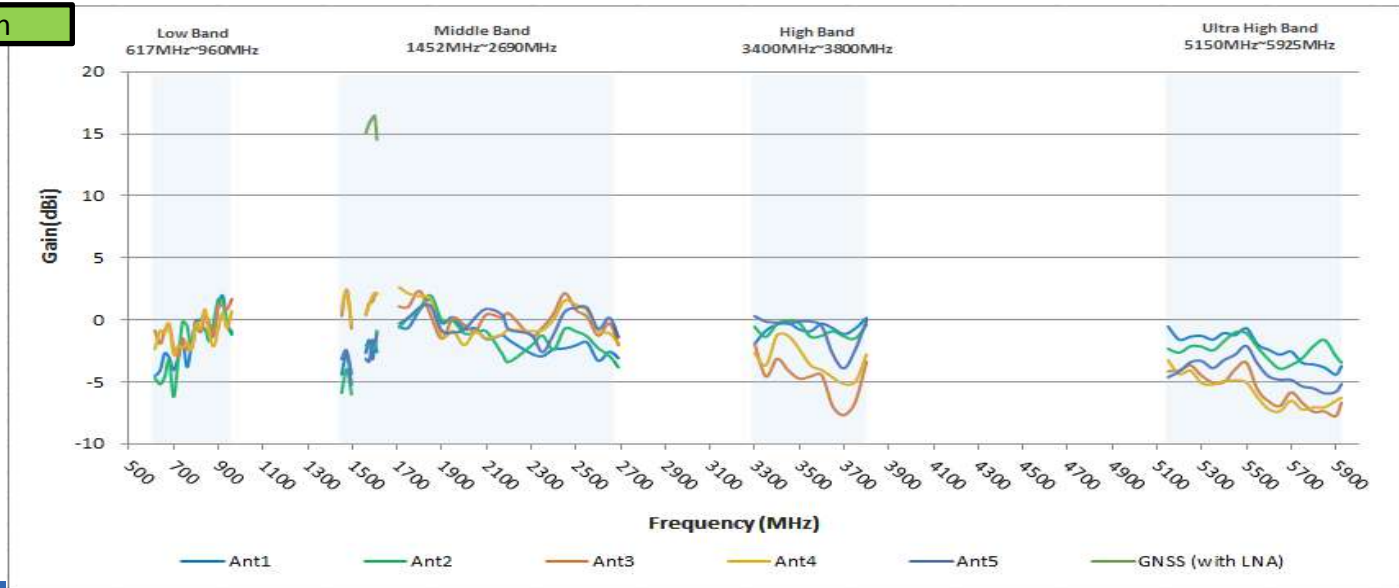


# Antenna Efficiency and Gain – Free Space

## Efficiency



## Gain



# Antenna Efficiency and Gain – Free Space

	Ant1		Ant2		Ant3		Ant4		Ant5	
Freq. (MHz)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)
617	30.17	-4.52	26.83	-4.71	39.64	-0.86	42.70	-2.35	1.61	-21.08
640	28.74	-4.05	24.60	-5.19	36.04	-1.93	41.20	-0.88	1.41	-20.89
660	32.77	-2.71	28.25	-4.61	43.92	-0.89	44.82	-1.09	1.84	-18.98
680	36.91	-3.03	32.67	-3.26	48.21	-0.36	49.15	-0.30	2.63	-15.58
700	26.80	-4.05	24.76	-6.21	33.22	-2.23	33.86	-2.80	3.37	-14.79
720	26.87	-3.07	27.50	-3.36	32.92	-2.95	34.11	-2.09	3.10	-14.33
740	28.90	-1.61	29.82	-0.18	35.11	-1.49	35.04	-2.28	2.69	-15.86
760	21.24	-3.80	25.29	-0.48	28.24	-2.37	31.45	-1.83	1.99	-16.25
780	24.47	-1.98	23.49	-2.28	28.52	-2.12	30.18	-2.37	1.79	-18.32
800	31.03	-0.04	28.81	-0.63	34.86	-0.15	37.04	-0.40	1.66	-18.31
820	36.10	-0.04	31.58	-0.94	38.00	-0.99	38.41	-0.69	1.74	-18.89
840	41.48	0.46	37.09	-0.69	41.61	0.18	41.77	0.86	2.73	-14.29
860	39.06	-0.41	36.88	-1.72	39.97	-0.26	37.45	-1.22	4.59	-11.03
880	30.38	-0.77	29.30	-0.16	30.49	-1.34	28.87	-2.14	4.51	-11.81
900	24.88	1.08	27.39	1.68	33.12	1.24	26.46	-0.71	3.60	-11.41
920	18.27	1.94	21.22	1.55	27.54	1.09	21.29	0.59	3.16	-11.82
940	26.23	-0.34	26.78	-0.40	35.71	0.87	30.43	-0.67	2.42	-14.24
960	28.01	-0.97	26.82	-1.20	41.02	1.69	34.85	0.71	2.03	-17.01
1452	23.91	-4.39	22.49	-5.89	39.13	0.33	40.70	0.92	22.26	-3.16
1475	30.92	-2.72	28.90	-3.96	47.54	2.45	49.18	2.35	27.72	-2.51
1496	7.06	-4.32	5.11	-6.00	19.04	-0.69	22.86	-0.30	3.82	-5.24
1560	23.70	-2.67	26.46	-2.03	32.65	0.40	35.07	0.37	23.24	-3.13
1575	26.95	-1.62	29.69	-1.99	34.65	1.34	37.81	1.24	22.68	-3.37
1590	23.15	-3.19	29.13	-2.13	37.62	1.46	40.23	1.92	27.61	-1.63
1600	27.34	-2.06	28.81	-2.32	39.14	2.04	43.69	2.19	27.64	-2.02
1610	27.04	-2.60	33.06	-0.86	41.10	2.15	44.87	2.06	30.69	-1.09

# Antenna Efficiency and Gain – Free Space

	Ant1		Ant2		Ant3		Ant4		Ant5	
Freq. (MHz)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)
1710	27.22	-0.56	26.16	-0.58	35.87	1.08	38.52	2.64	29.62	-0.28
1750	30.87	-0.64	34.35	0.16	39.85	1.06	41.81	2.13	37.53	0.16
1800	30.93	0.79	36.20	0.92	37.58	2.34	37.29	1.91	34.98	0.98
1850	31.62	1.62	34.60	1.99	34.43	0.39	36.24	1.67	33.22	1.11
1900	36.49	-0.24	36.90	-0.02	32.62	-1.52	35.15	-1.35	32.99	-0.87
1950	30.53	0.22	27.13	-0.05	23.33	0.15	23.97	-0.89	25.82	-1.02
2000	35.21	-0.74	32.87	-1.09	28.72	-0.39	28.43	-2.04	34.67	-0.79
2050	28.69	-0.68	29.39	-1.03	25.74	-0.88	27.14	-0.96	35.90	0.20
2100	17.95	-1.55	20.40	-0.93	19.10	0.44	19.23	-1.47	31.55	0.89
2170	7.87	-1.23	5.46	-2.72	11.12	0.19	9.89	-1.16	21.32	0.42
2200	33.20	-1.63	28.35	-3.38	33.23	0.53	34.13	-0.80	39.71	-0.76
2300	19.97	-2.70	23.07	-2.09	22.80	-1.26	25.02	-0.91	26.59	-1.19
2350	19.80	-2.93	24.21	-1.26	25.21	-0.61	26.36	-0.83	26.43	-2.60
2400	24.00	-2.37	25.63	-2.41	31.71	0.50	32.77	0.03	30.89	-1.17
2450	27.36	-2.30	29.22	-0.72	37.18	2.16	37.56	1.55	34.93	0.66
2500	28.99	-2.06	31.79	-0.93	39.55	0.81	39.55	1.23	38.45	0.96
2550	29.99	-1.81	33.01	-1.34	37.29	0.25	37.31	0.75	37.75	0.98
2600	25.13	-3.30	28.05	-2.28	29.73	-1.26	31.05	-0.86	32.70	-0.73
2650	22.28	-2.57	22.44	-2.90	25.82	-0.27	26.92	-1.07	28.33	0.18
2690	25.71	-3.08	23.67	-3.82	26.85	-2.04	27.68	-1.90	30.75	-1.41
3300	29.07	-1.93	27.97	-0.55	25.27	-1.91	22.47	-2.66	27.38	0.30
3350	25.97	-1.85	24.96	-0.94	20.08	-3.03	18.95	-2.58	23.90	-0.10
3400	29.28	-0.27	27.67	-0.31	20.53	-3.14	21.52	-1.25	24.45	0.30
3450	27.76	0.65	25.08	-0.05	16.84	-4.06	18.69	-1.27	20.89	0.03
3500	26.60	0.65	23.66	-0.27	15.88	-4.74	17.25	-2.36	22.10	0.06
3550	25.19	-0.88	23.49	-1.36	16.79	-4.56	17.53	-3.66	25.17	-0.13

# Antenna Efficiency and Gain – Free Space

	Ant1		Ant2		Ant3		Ant4		Ant5	
Freq. (MHz)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)	Efficiency(%)	Peak Gain(dBi)
3600	25.49	-0.31	22.69	-1.27	16.17	-4.46	17.18	-4.04	24.38	-0.49
3650	23.81	-0.68	21.74	-0.91	13.84	-7.00	16.39	-4.65	19.58	-2.79
3700	22.18	-1.15	20.26	-1.34	13.04	-7.68	15.44	-5.17	18.68	-3.90
3750	22.07	-0.69	19.48	-1.50	13.71	-6.63	15.03	-5.01	21.24	-2.42
3800	23.30	0.15	20.35	-0.40	16.04	-3.36	16.68	-2.79	25.61	-0.07
5150	21.17	-0.53	18.62	-2.32	18.47	-4.15	18.14	-3.27	17.23	-4.62
5200	19.14	-1.59	16.82	-2.65	17.45	-4.07	16.65	-4.36	16.72	-4.17
5250	21.79	-1.35	19.75	-2.12	19.80	-3.67	19.20	-4.09	19.97	-3.42
5300	23.24	-1.29	21.34	-2.16	19.68	-4.51	19.36	-5.10	19.94	-3.32
5350	22.32	-1.59	20.25	-2.47	17.85	-5.04	17.72	-5.22	17.79	-3.88
5400	20.46	-1.05	18.54	-1.72	16.32	-5.01	16.18	-4.92	16.23	-3.24
5450	19.26	-1.23	18.18	-1.00	16.20	-3.99	15.76	-4.88	16.68	-2.80
5500	19.65	-0.68	19.15	-1.07	16.75	-3.45	16.13	-5.05	17.86	-2.10
5550	18.71	-1.97	18.46	-2.21	15.40	-5.63	15.15	-6.25	16.38	-3.53
5600	17.12	-2.41	16.82	-3.20	13.63	-6.57	13.60	-7.20	14.19	-4.55
5650	16.85	-2.80	16.22	-3.94	13.72	-6.94	13.61	-7.38	14.23	-4.82
5700	16.67	-2.55	15.95	-3.65	13.89	-5.85	13.48	-6.52	14.63	-4.84
5750	18.26	-3.46	18.27	-3.10	15.75	-6.67	15.27	-7.23	16.82	-5.36
5800	19.99	-3.59	21.08	-2.13	17.04	-7.40	17.08	-7.05	18.23	-5.52
5850	20.57	-3.84	21.95	-1.63	16.88	-7.38	17.54	-7.04	18.13	-5.93
5900	18.38	-4.41	18.72	-2.91	14.53	-7.77	15.65	-6.52	16.06	-5.81
5925	17.27	-3.73	17.14	-3.44	14.08	-6.68	14.85	-6.29	15.76	-5.18



# TAOGLAS®



# Datasheet

## Synergy 5 in 1 Antenna

**Part No:**  
MA1505.AK.008

### Description:

1\*Active GNSS with RG-174LL & SMA(M)  
5\*5G/4G MIMO with RG-174LL & SMA(M)

### Features:

4 x 5G/4G(600MHz-6GHz) MIMO Antenna  
1 x GPS/GLONASS/BeiDou Antenna Front End GNSS SAW Filter  
IP67 Rated Waterproof Enclosure  
High Efficiency/Peak Gain Outdoor Antenna  
Cable: 300mm RG-174LL with 4700mm TGC-200  
Connectors: SMA(M) / RP-SMA(M)  
RoHS & REACH Compliant

## 2. Specifications

GNSS Frequency Bands Covered							
GPS/QZSS	L1 1575.42MHz	L2 1227.6MHz	L5 1176.45MHz	L6 1278.75MHz			
	■	□	□	□			
GLONASS	L5R 1176.45MHz	L3PT 1201.5MHz	L2PT 1246MHz	L1CR 1575.42MHz	L1PT 1602MHz		
	□	□	□	■	■		
Galileo	E5a 1176.45MHz	E5b 1201.5MHz	E4 1215MHz	E3 1256MHz	E6 1278.75MHz	E2 1561MHz	L1 1575.42MHz
	□	□	□	□	□	■	■
BeiDou	B1 1561MHz	B2 1207.14MHz	B3 1268.52MHz				
	■	□	□				
Compass	E5B(B2)/ E6(B3) 1268.56MHz	E2(B1) 1561MHz					
	□	■					
SBAS	Omnistar 1542.5MHz	WAAS/EGN OS 1575.42MHz					
	□	■					

GNSS Electrical			
Frequency (MHz)	1561	1575.42	1602
VSWR (max.)	2.5	2.5	2.5
Passive Antenna Efficiency (%) (Without cable loss)	40.02	48.39	44.29
Passive Antenna Gain at Zenith (dBic) (Without cable loss)	3.75	4.44	4.54
Axial Ratio (dB)	20	11	15
Polarization	RHCP		
Impedance	50Ω		
Cable	RG-174		
Connector	SMA(M)		

LNA and Filter Electrical Properties			
Frequency (MHz)	1561	1575.42	1602
VSWR (max.)	2.0:1	2.0:1	2.0:1
Gain@1.8V (dBic)	28.8 dB	28.8 dB	28 dB
Gain@3.0V (dBic)	29 dB	29 dB	28.3 dB
Gain@5.5V (dBic)	29.6 dB	29.4 dB	28.7 dB
Noise@1.8V (dB)	2.8 dB	2.3 dB	2.8 dB
Noise@3.0V (dB)	2.8 dB	2.2 dB	2.8 dB
Noise@5.5V (dB)	2.9 dB	2.3 dB	2.8 dB
Power consumption@1.8V (mA)	8.7 mA		
Power consumption@3.0V (mA)	9.0 mA		
Power consumption@5.5V (mA)	11 mA		
Total Specification (Through Antenna, SAW Filter and LNA)			
Frequency (MHz)	1561	1575.42	1602
Gain@3V (dBic)	31.7 ± 3	32.4 ± 3	32.4 ± 3
Output Impedance	50Ω		



5G/4G Antenna											
Frequency (MHz)		5G NR Band 71	LTE700	GSM 850/900	5G NR Band	DCS	PCS	UMTS1	LTE2600	5G NR Band 77, 78, 79	LTE5200/ Wi-Fi 5800
		617 ~698	698 ~824	824 ~960	1427 ~1518	1710 ~1880	1850 ~1990	1920 ~2170	2300 ~2690	3300 ~3800	5150 ~5925
Efficiency (%)											
MIMO 1	5m	21.5	22.7	40.5	33.8	37.2	26.1	23.7	29.5	37.0	33.8
MIMO 2	5m	18.5	23.2	38.6	34.2	35.9	25.6	23.4	28.4	37.1	32.8
MIMO 3	5m	18.3	24.2	26.9	35.4	37.9	32.3	29.9	37.1	23.4	30.7
MIMO 4	5m	20.1	23.6	25.8	36.7	37.0	32.9	30.9	36.4	22.3	33.1
Average Gain (dB)											
MIMO 1	5m	-6.67	-6.45	-3.92	-4.71	-4.30	-5.83	-6.26	-5.30	-4.32	-4.71
MIMO 2	5m	-7.32	-6.35	-4.13	-4.66	-4.45	-5.92	-6.31	-5.46	-4.30	-4.84
MIMO 3	5m	-7.37	-6.16	-5.70	-4.51	-4.22	-4.91	-5.24	-4.31	-6.31	-5.13
MIMO 4	5m	-6.96	-6.26	-5.88	-4.36	-4.31	-4.83	-5.10	-4.39	-6.51	-4.81
Peak Gain (dBi)											
MIMO 1	5m	-1.92	-0.37	2.96	2.22	2.72	0.23	0.03	2.24	4.28	3.33
MIMO 2	5m	-2.48	-0.56	2.44	2.08	3.07	0.38	0.03	2.28	4.26	3.20
MIMO 3	5m	-2.19	-1.41	0.47	2.04	3.29	1.64	1.69	3.19	1.61	2.87
MIMO 4	5m	-2.14	-1.54	0.05	2.13	2.97	1.62	1.25	3.40	1.03	3.57
Impedance		50 $\Omega$									
Polarization		Linear									
Radiation Pattern		Omni									
Max. input power		10W									

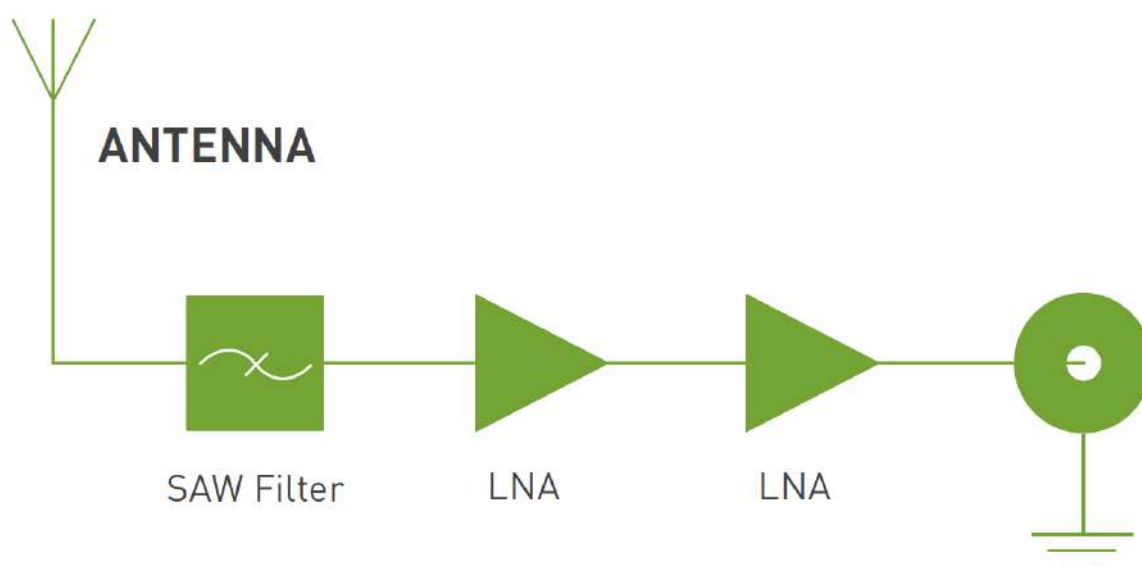
Mechanical	
Height	57.47mm
Planner Dimension	Ø160mm
Casing	PC
Cable	0.3m RG-174LL with 4.7m TGC-200 for 5G/4G – Fully Customizable 0.3m RG174LL with 4.7m TGC-200 for GNSS – Fully Customizable
Connector	5G/4G_SMA-Plug – Fully Customizable GNSS_SMA-Plug – Fully Customizable
Thread	18.23mm
Thread Diameter	M22
Waterproof	IP67
Sealant	Rubber Stopper and O-Ring
Weight	2.7Kg
Environmental	
Ingress Protection	IP67
Temperature Range	-40°C to 85°C
Humidity	Non-condensing 65°C 95% RH
Cable Pull	RG-174 4 Kg

5G/4G Bands			
Band Number	5G NR / FR1 / LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA		
	Uplink	Downlink	Covered
1	UL: 1920 to 1980	DL: 2110 to 2170	✓
2	UL: 1850 to 1910	DL: 1930 to 1990	✓
3	UL: 1710 to 1785	DL: 1805 to 1880	✓
4	UL: 1710 to 1755	DL: 2110 to 2155	✓
5	UL: 824 to 849	DL: 869 to 894	✓
7	UL: 2500 to 2570	DL: 2620 to 2690	✓
8	UL: 880 to 915	DL: 925 to 960	✓
9	UL: 1749.9 to 1784.9	DL: 1844.9 to 1879.9	✓
11	UL: 1427.9 to 1447.9	DL: 1475.9 to 1495.9	✓
12	UL: 699 to 716	DL: 729 to 746	✓
13	UL: 777 to 787	DL: 746 to 756	✓
14	UL: 788 to 798	DL: 758 to 768	✓
17	UL: 704 to 716	DL: 734 to 746	✓
18	UL: 815 to 830	DL: 860 to 875	✓
19	UL: 830 to 845	DL: 875 to 890	✓
20	UL: 832 to 862	DL: 791 to 821	✓
21	UL: 1447.9 to 1462.9	DL: 1495.9 to 1510.9	✓
22	UL: 3410 to 3490	DL: 3510 to 3590	✓
23	UL: 2000 to 2020	DL: 2180 to 2200	✓
24	UL: 1625.5 to 1660.5	DL: 1525 to 1559	✓
25	UL: 1850 to 1915	DL: 1930 to 1995	✓
26	UL: 814 to 849	DL: 859 to 894	✓
27	UL: 807 to 824	DL: 852 to 869	✓
28	UL: 703 to 748	DL: 758 to 803	✓
29	UL: -	DL: 717 to 728	✓
30	UL: 2305 to 2315	DL: 2350 to 2360	✓
31	UL: 452.5 to 457.5	DL: 462.5 to 467.5	✗
32	UL: -	DL: 1452 - 1496	✓
35		1850 to 1910	✓
38		2570 to 2620	✓
39		1880 to 1920	✓
40		2300 to 2400	✓
41		2496 to 2690	✓
42		3400 to 3600	✓
43		3600 to 3800	✓
48		3550 to 3700	✓
66	UL: 1710-1780	DL: 2110-2200	✓
71		617 to 698	✓
74/75/76		1427 to 1518	✓
78		3300 to 3800	✓
79		4400 to 5000	✓

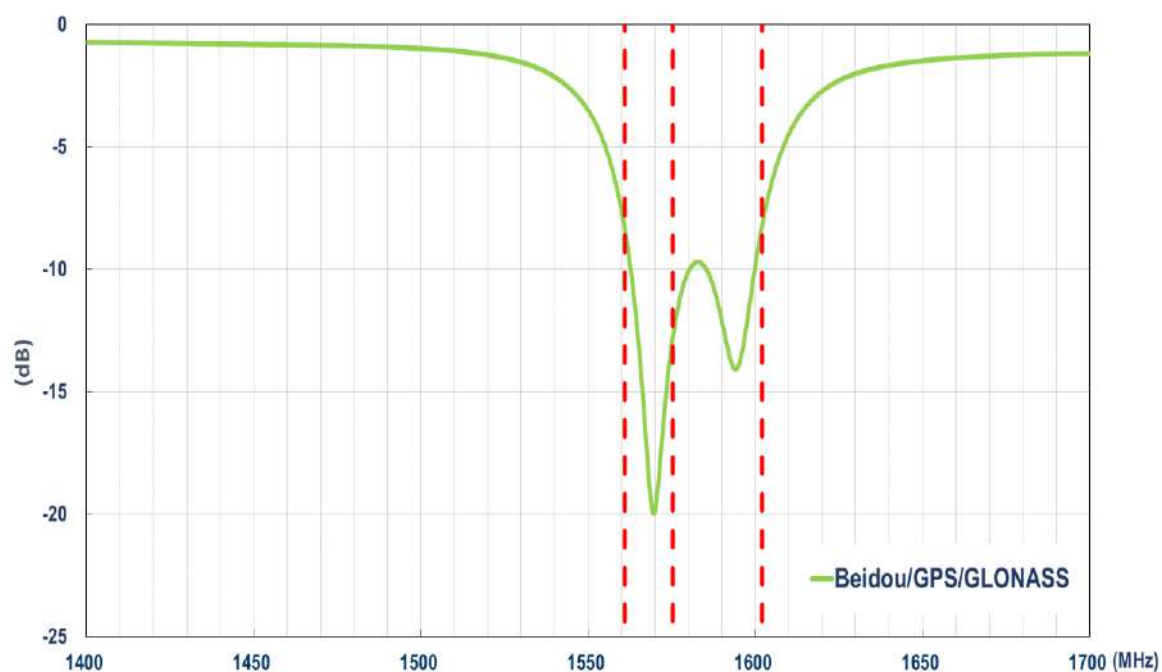
\* Covered Bands represent greater than 20% efficiency

## 3. Active Antenna Characteristics

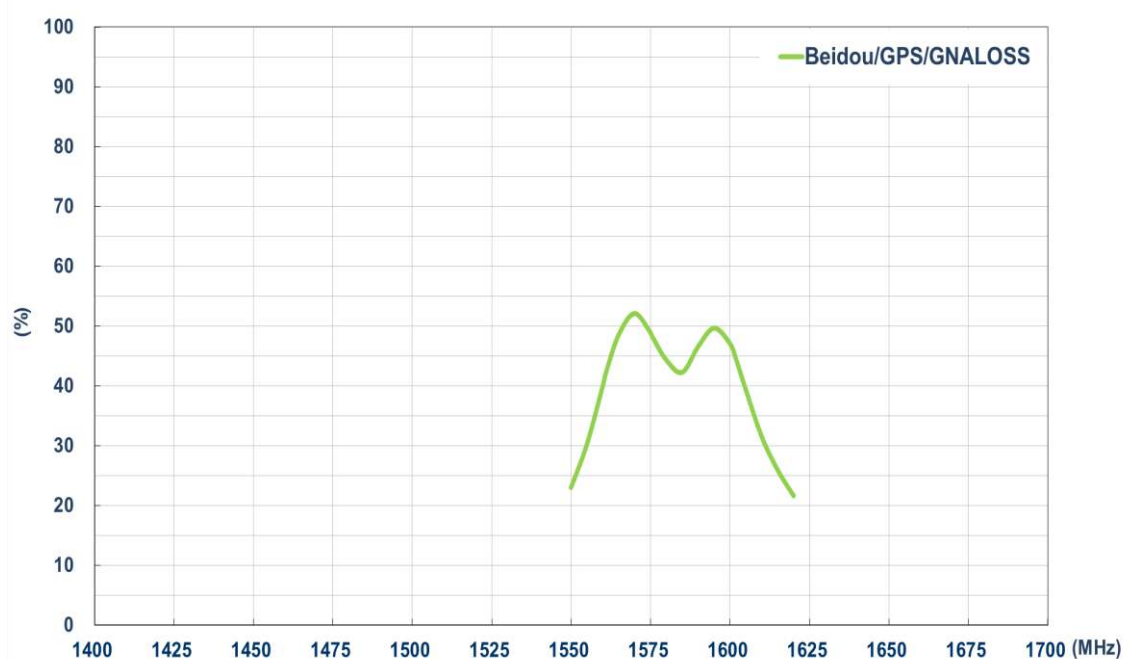
### 3.1 Block Diagram (Active antenna)



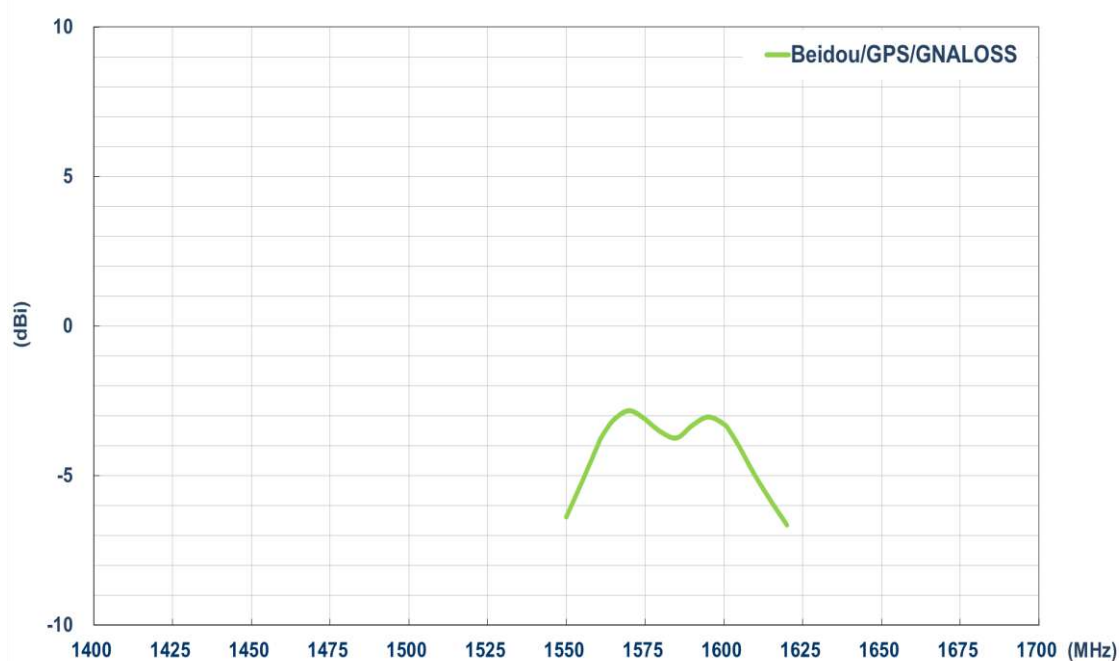
### 3.2 Passive Antenna Return Loss



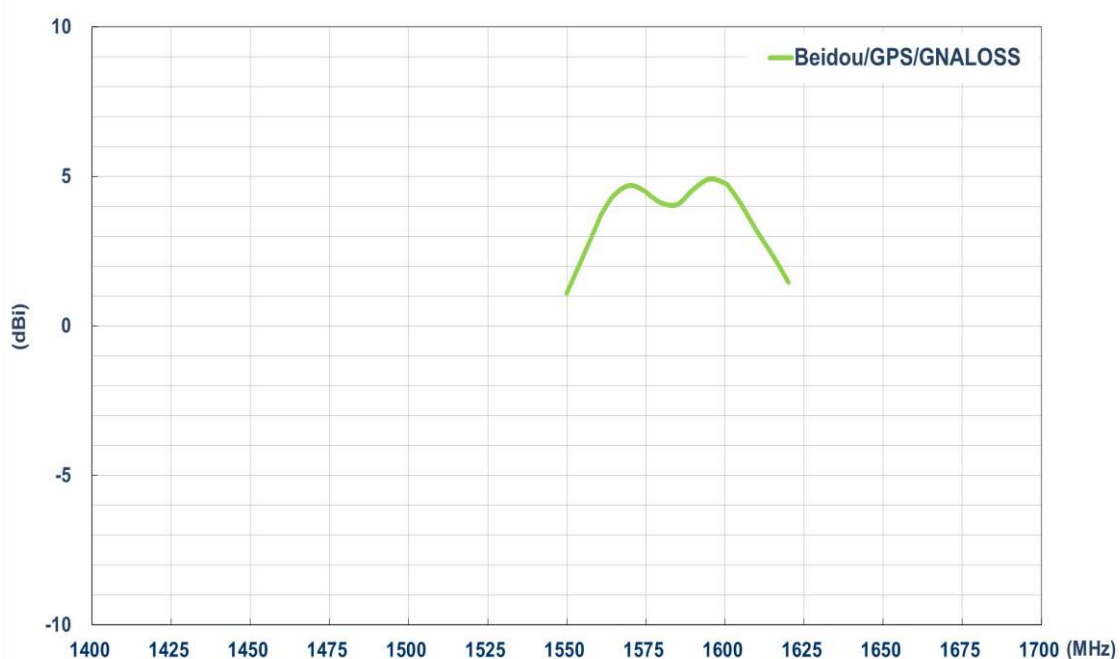
### 3.3 Passive Antenna Efficiency



### 3.4 Passive Antenna Average Gain

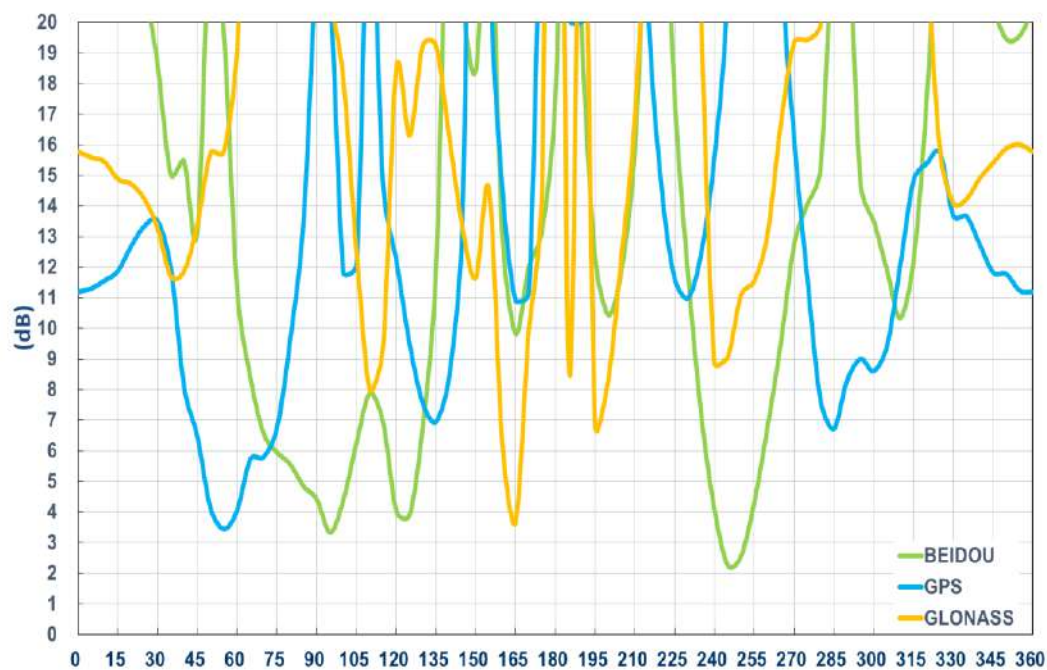


### 3.5 Passive Antenna Peak Gain

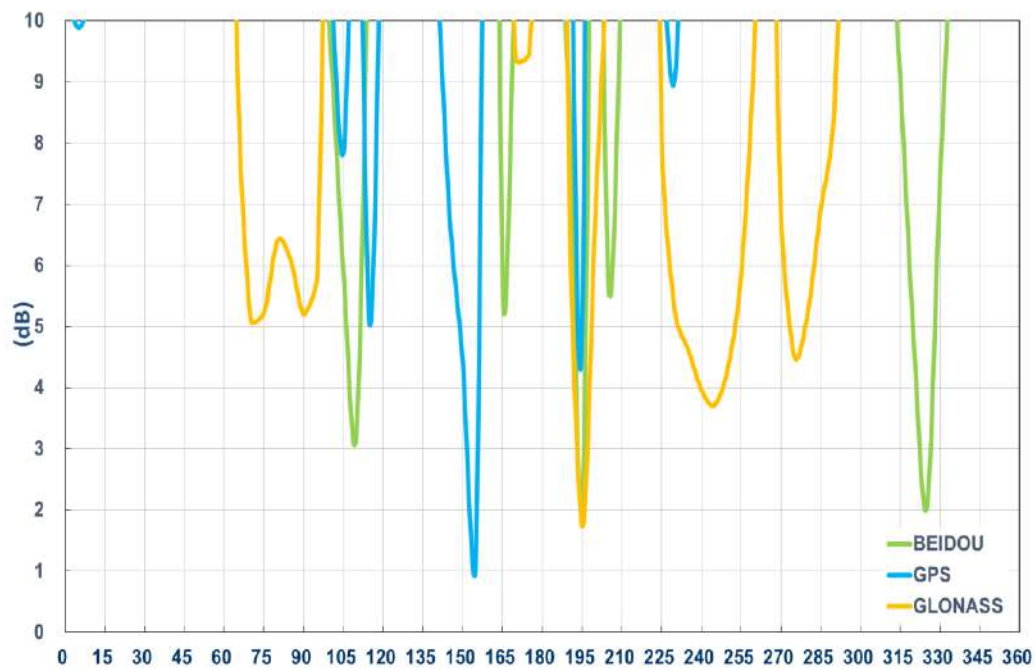


### 3.6 Passive Antenna Axial Ratio (Zenith is at 0°)

XZ-plane

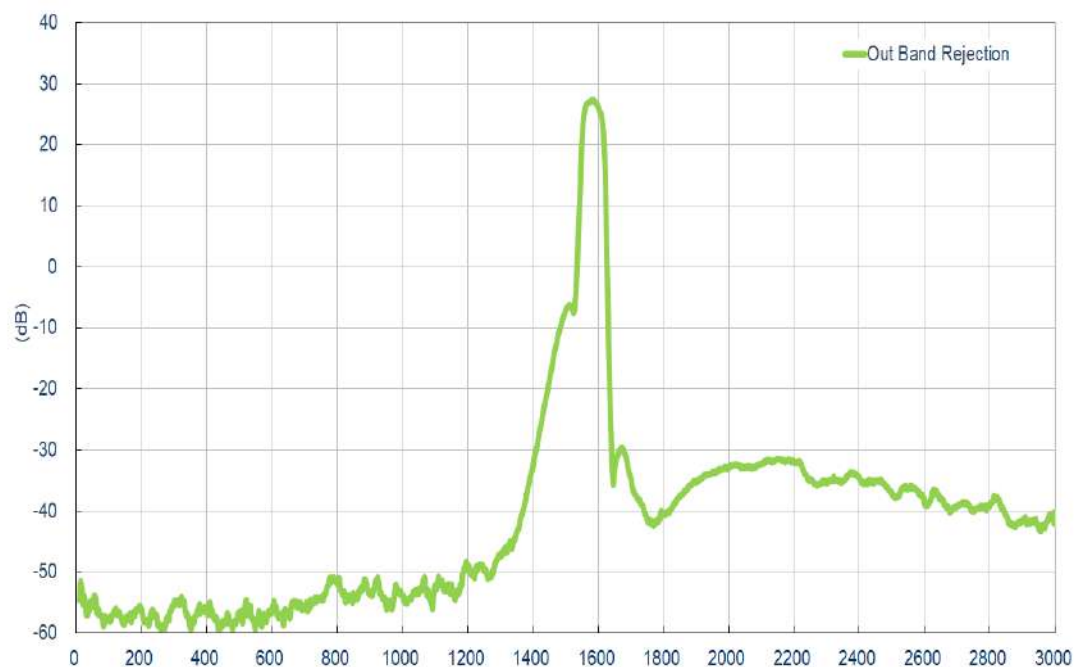


## YZ-plane

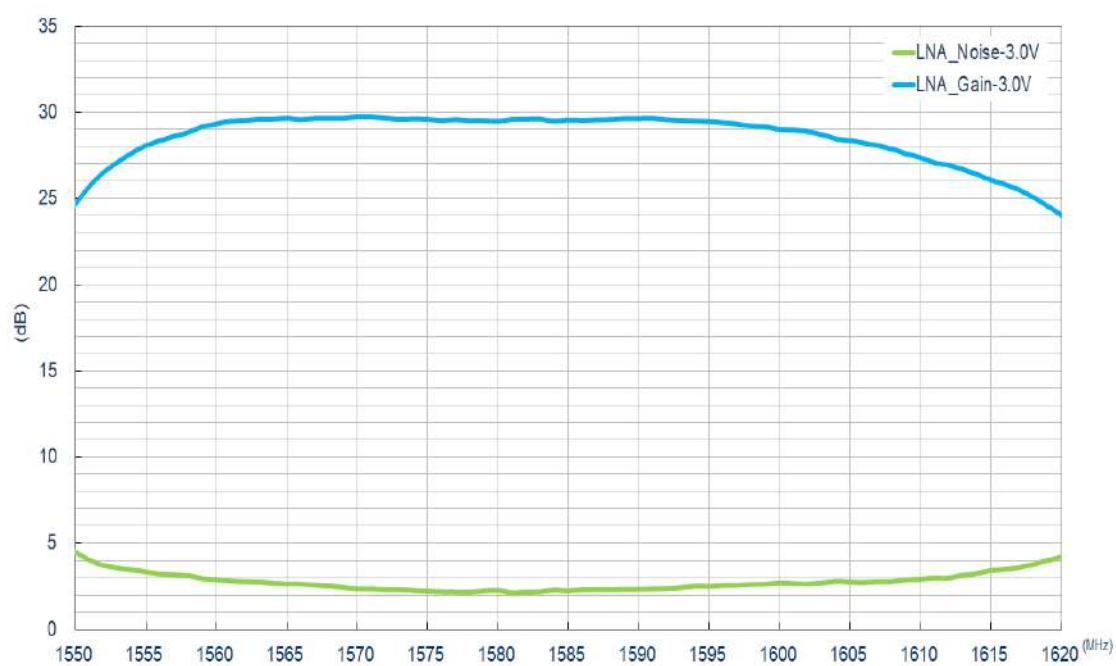


### 3.7 Active measurements

#### LNA Gain @ 3.0V



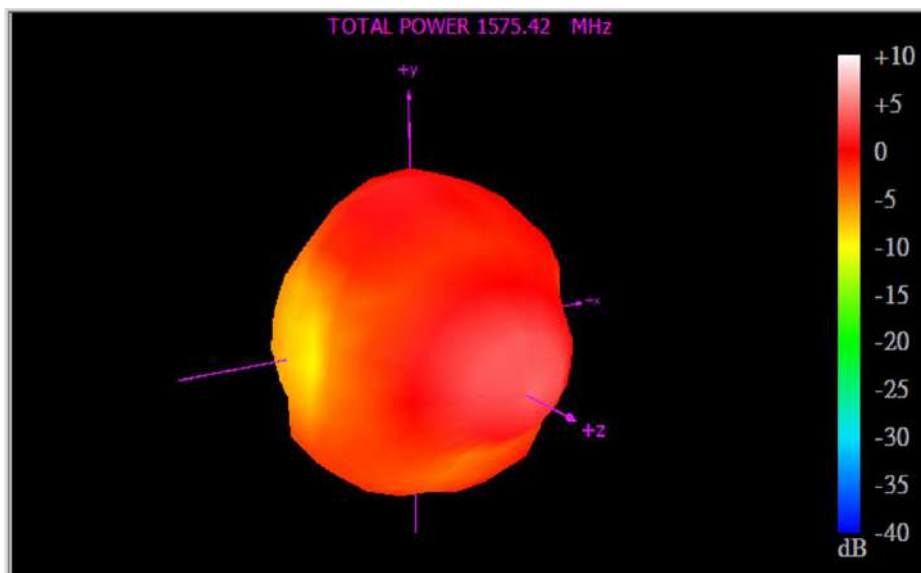
#### Noise Figure @ 3.0V



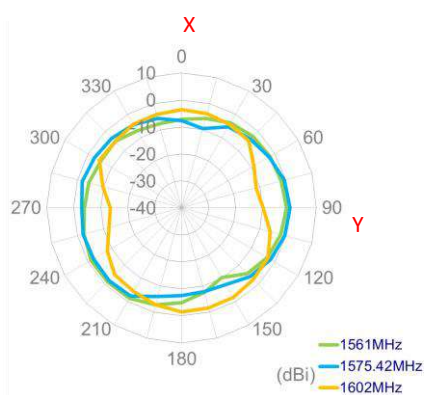


### 3.8 Passive Antenna Radiation Patterns

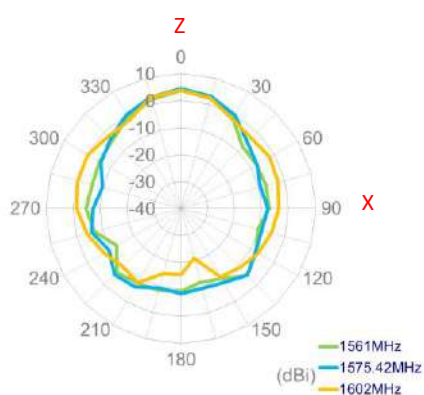
1575.42MHz



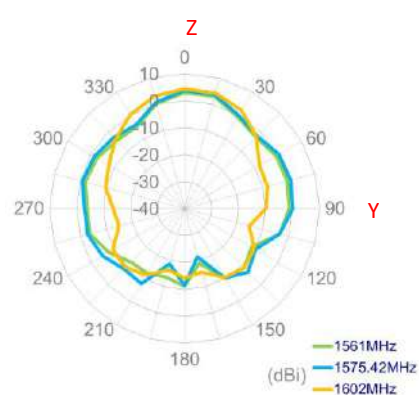
XY Plane



XZ Plane



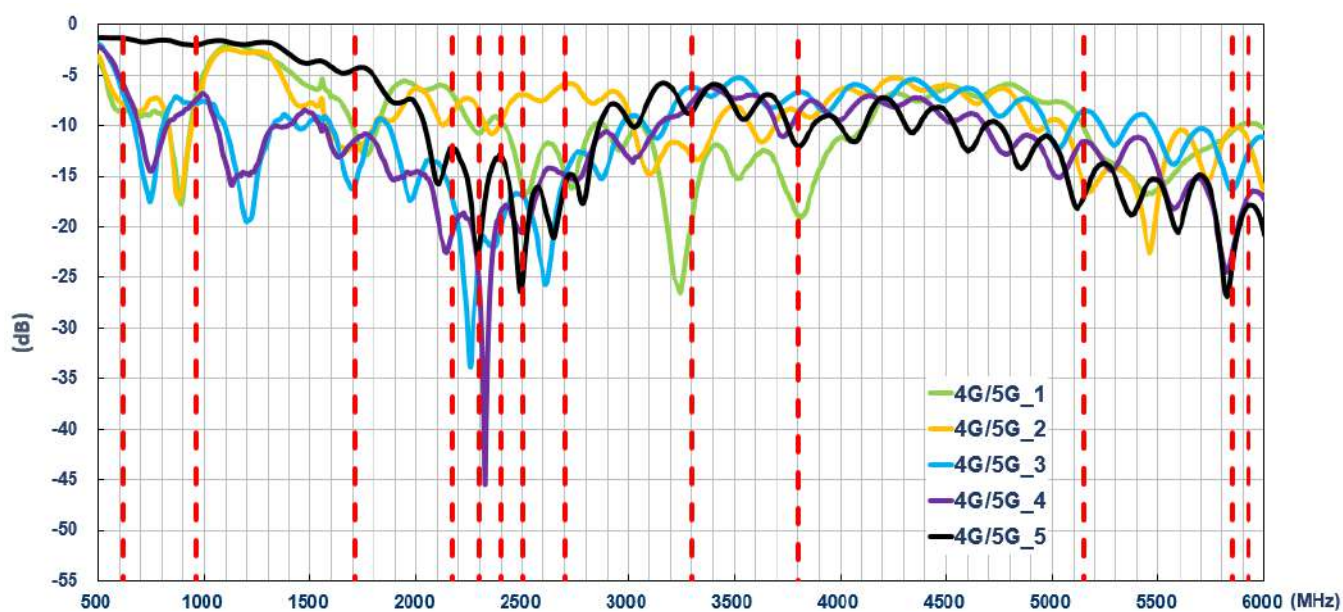
YZ Plane



## 4. Antenna Characteristics

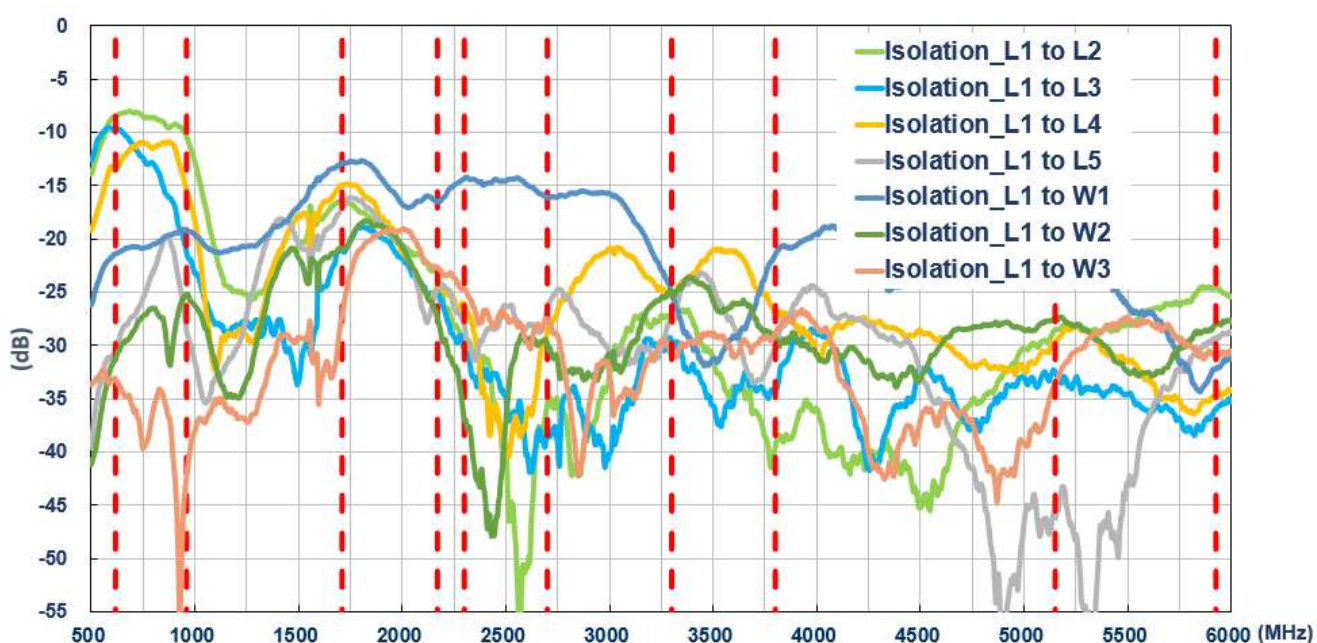
### 4.1 Return Loss

#### 5G/4G MIMO

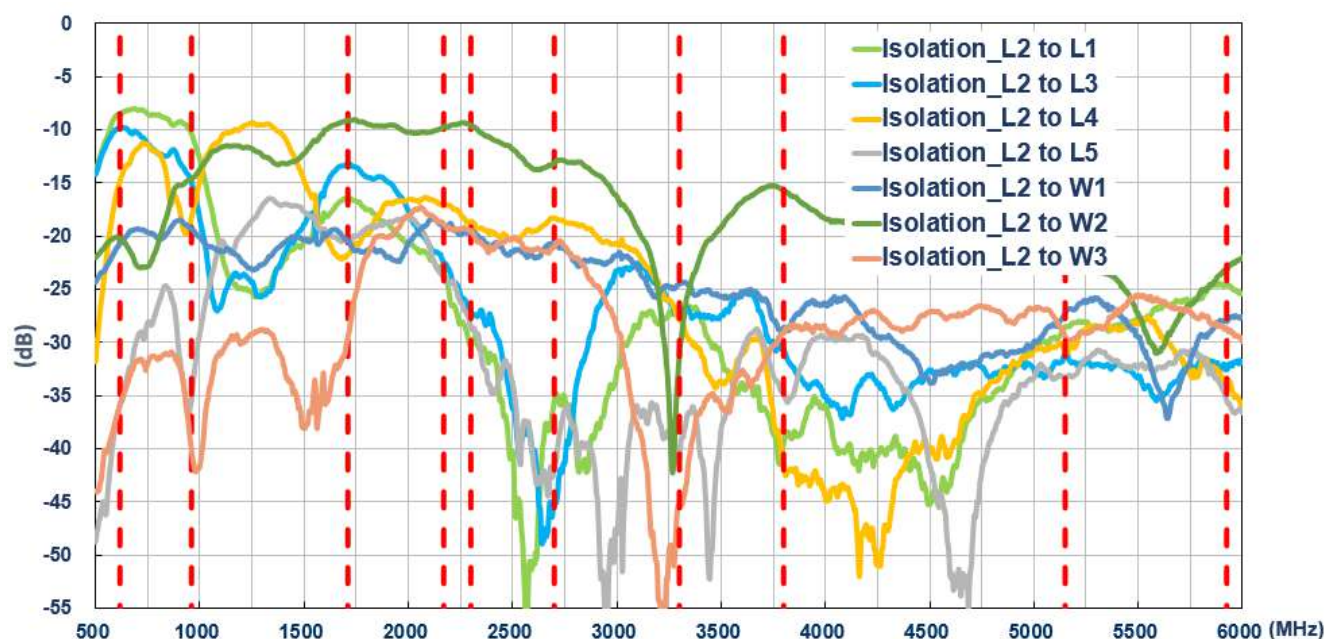


### 4.2 Isolation

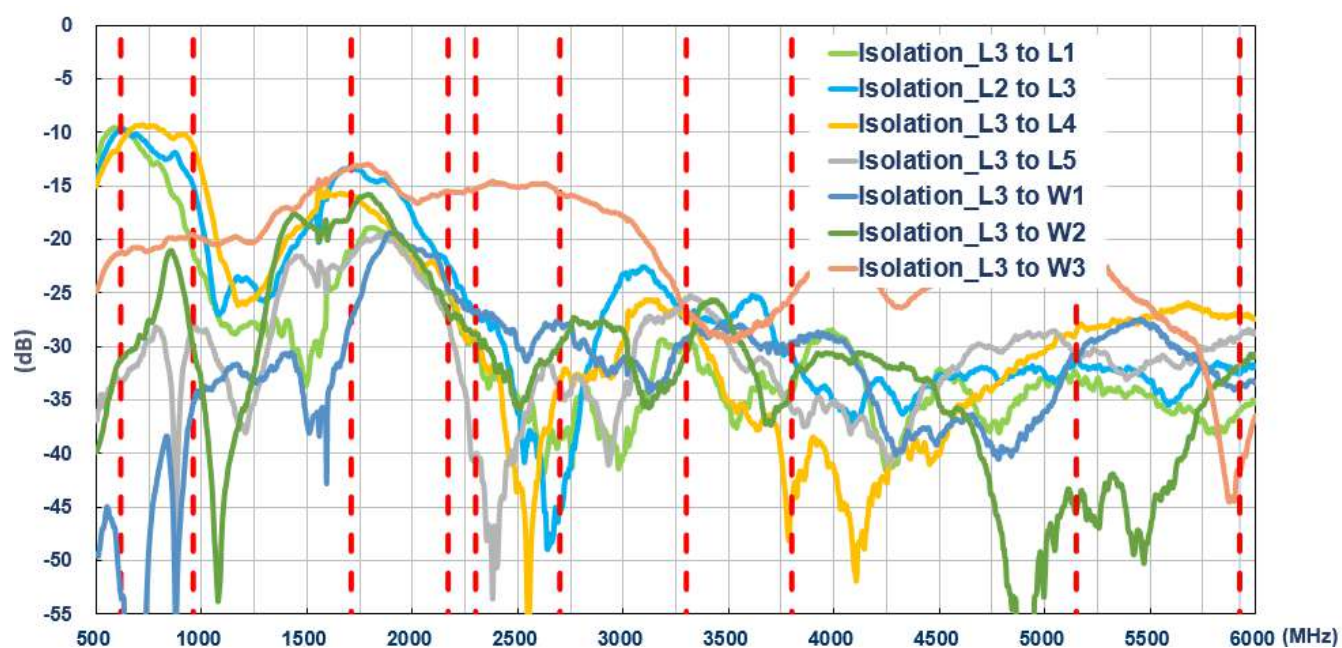
#### 5G/4G 1



## 5G/4G 2

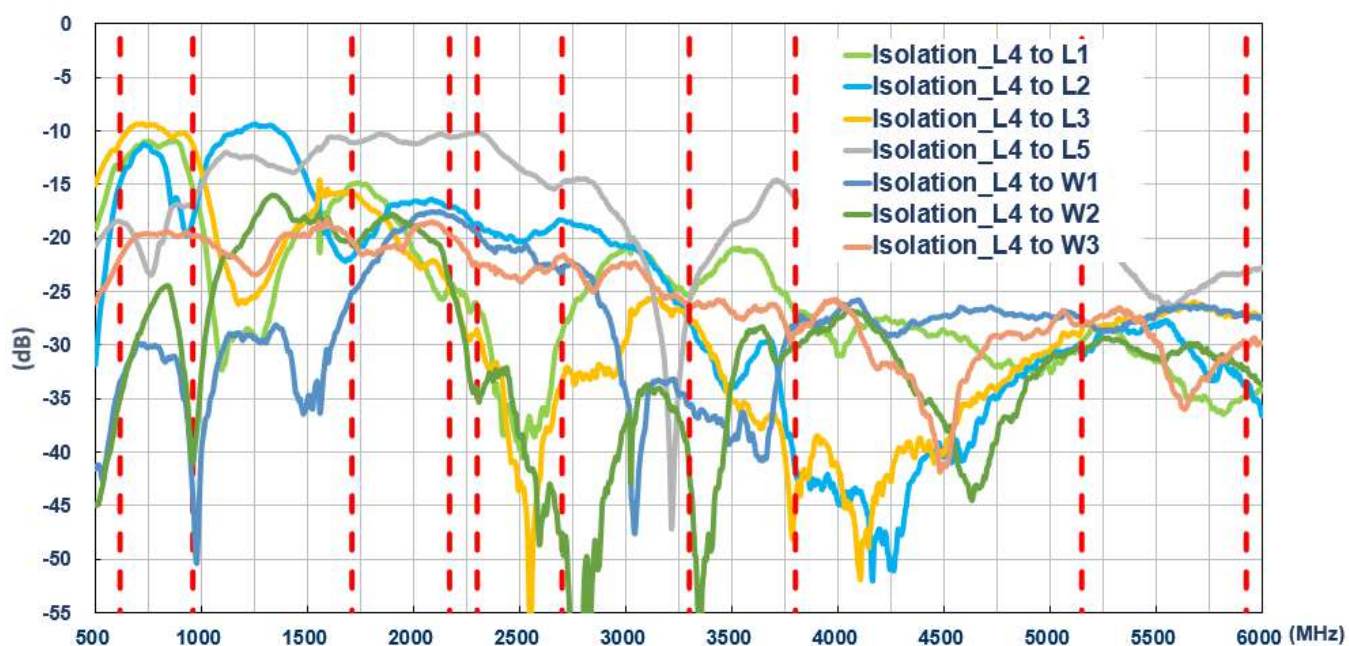


## 5G/4G 3



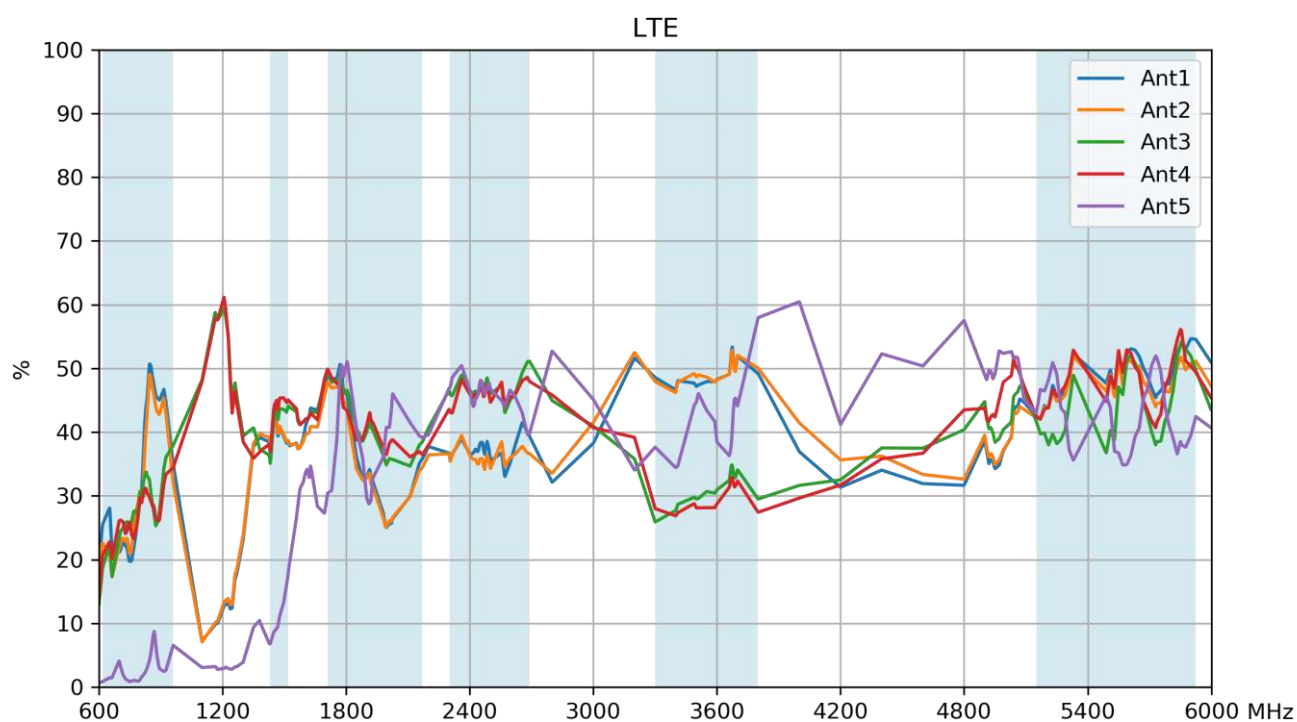


## 5G/4G 4



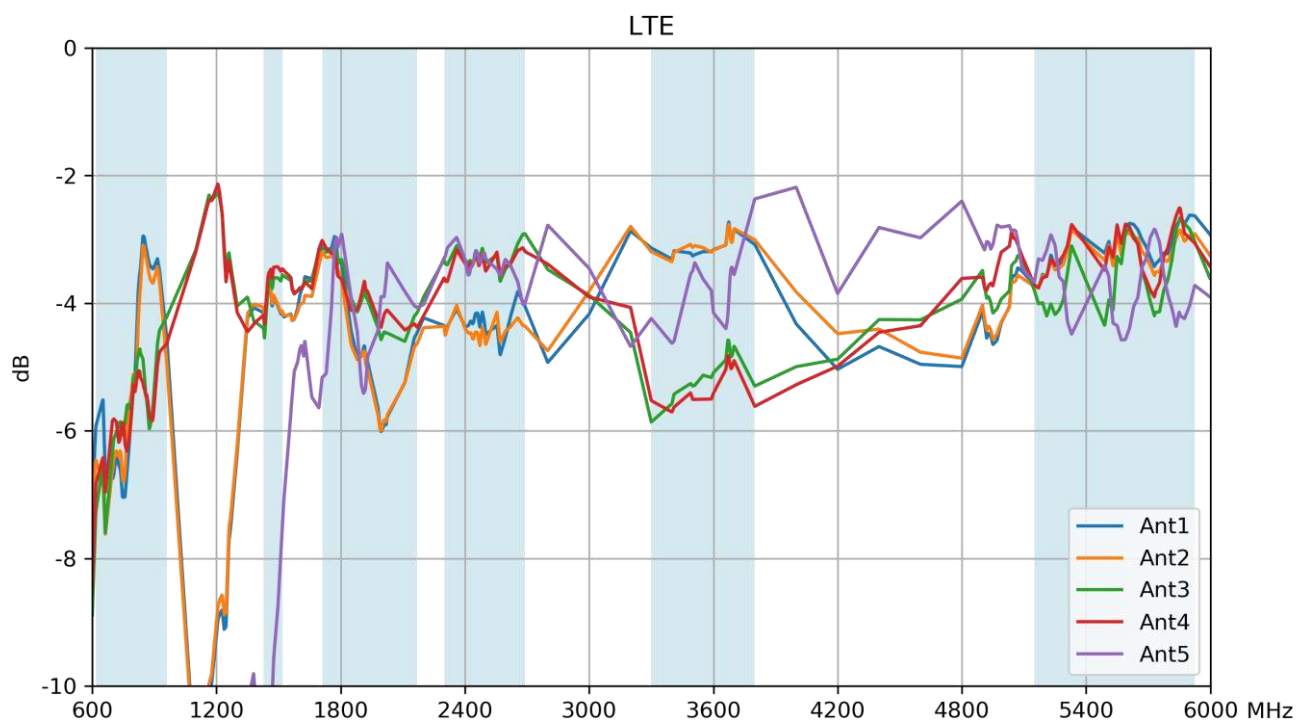
### 4.3 Efficiency

## 5G/4G MIMO



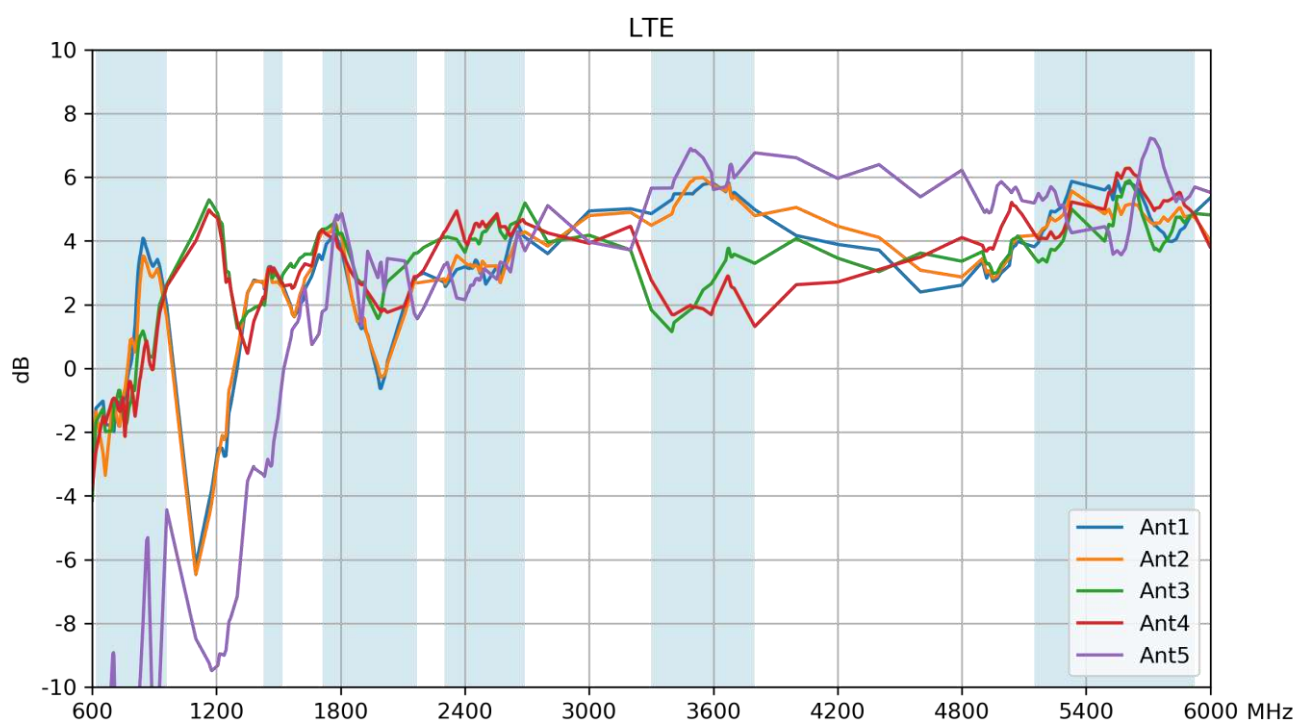
## 4.4 Average Gain

### 5G/4G MIMO



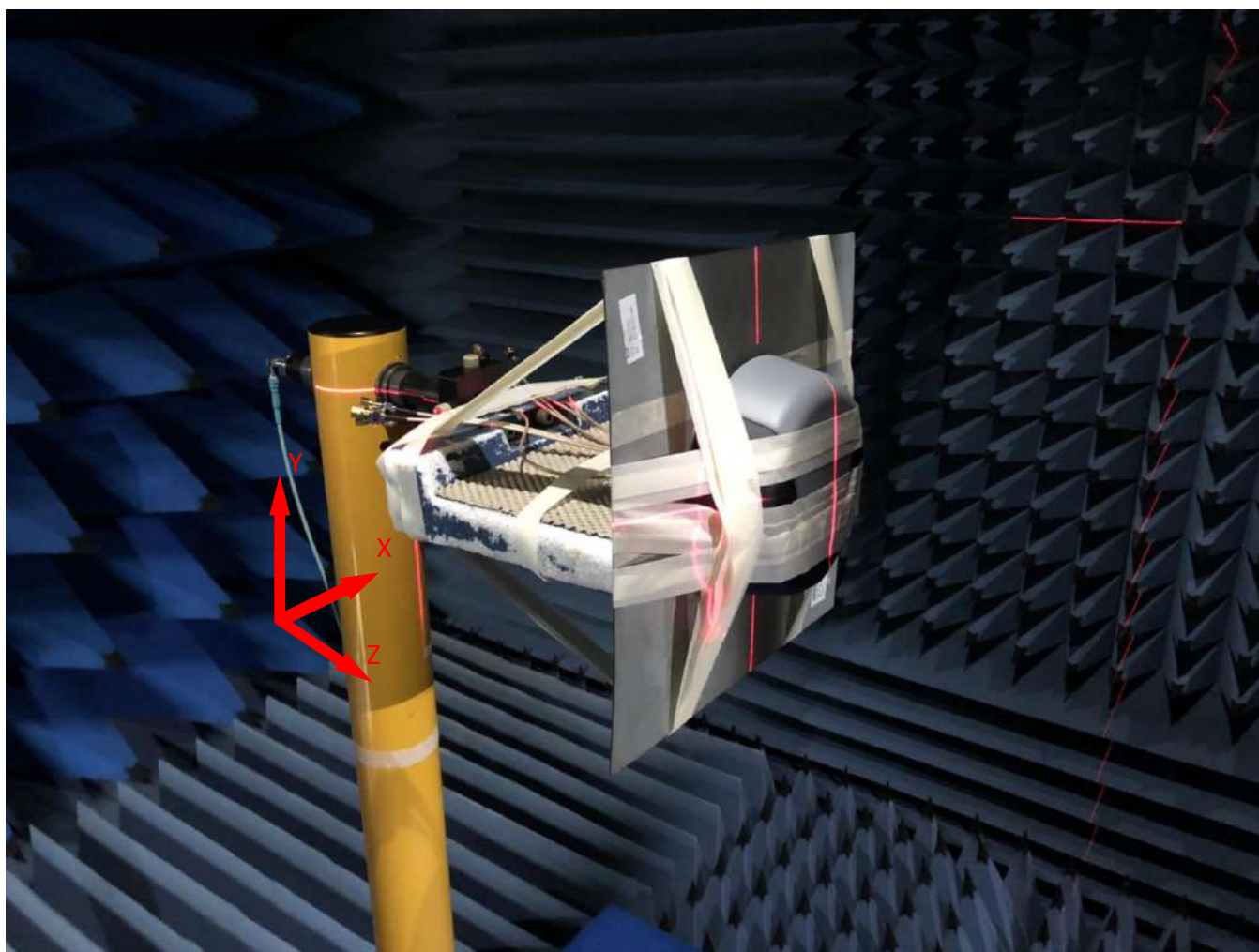
## 4.5 Peak Gain

### 5G/4G MIMO



## 5. Radiation Patterns

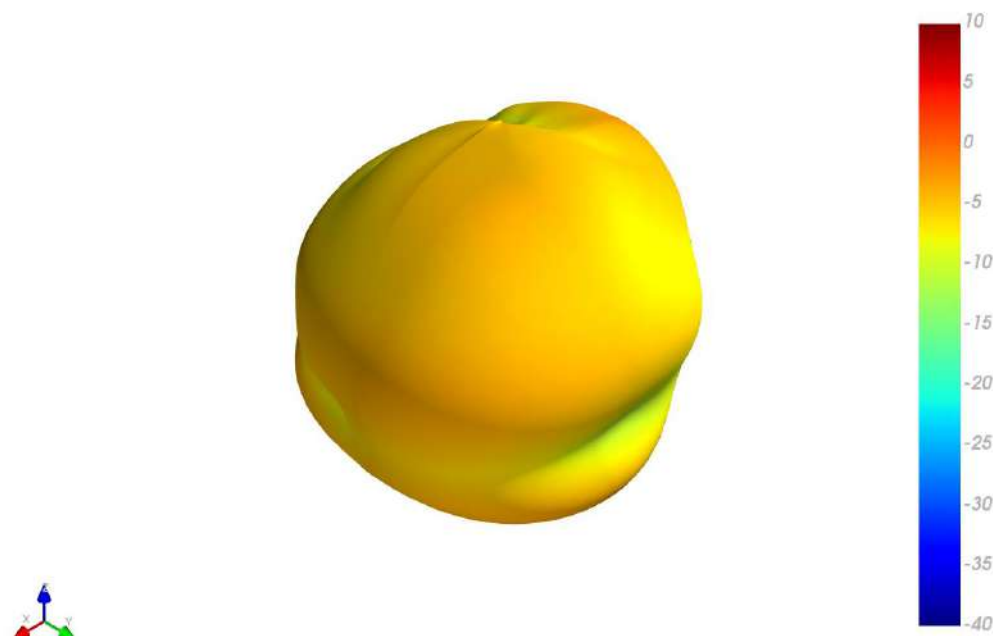
### 5.1 Test Setup



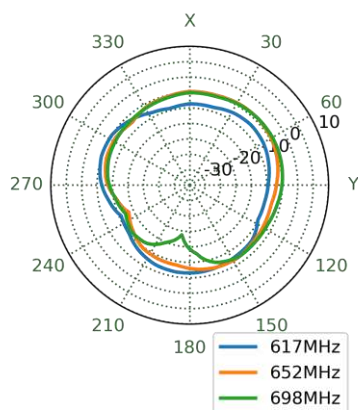
On 30x30cm Ground Plane

## 5.2 5G/4G MIMO 1 Radiation Pattern

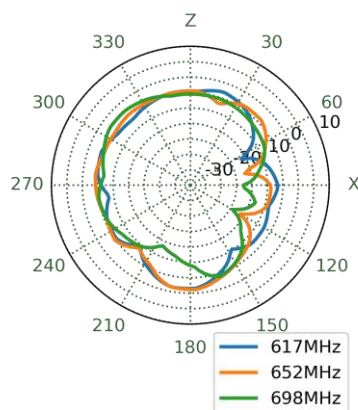
652MHz



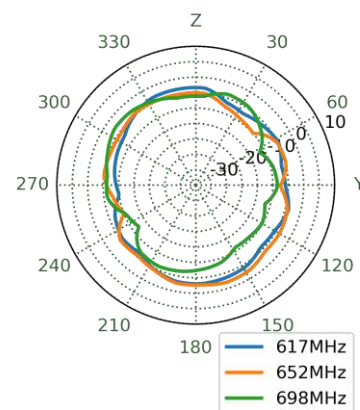
XY Plane



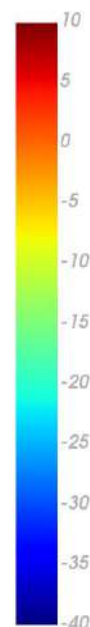
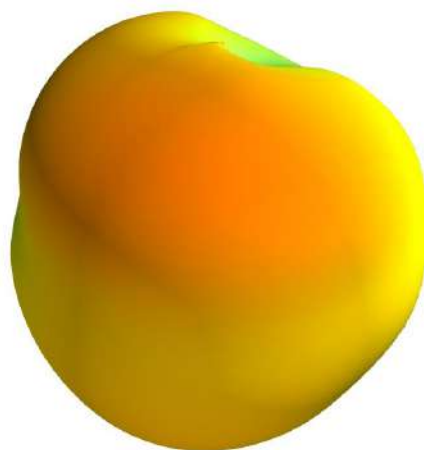
XZ Plane



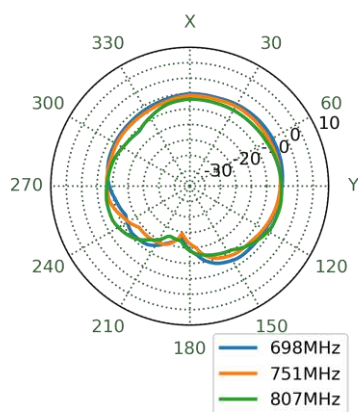
YZ Plane



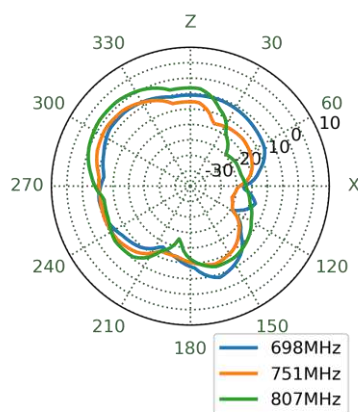
751MHz



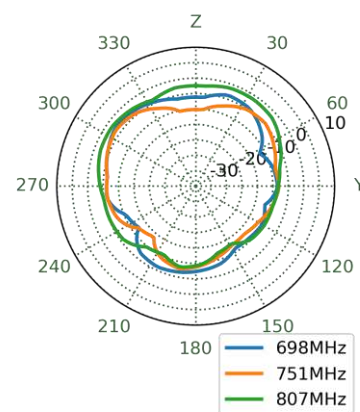
XY Plane



XZ Plane

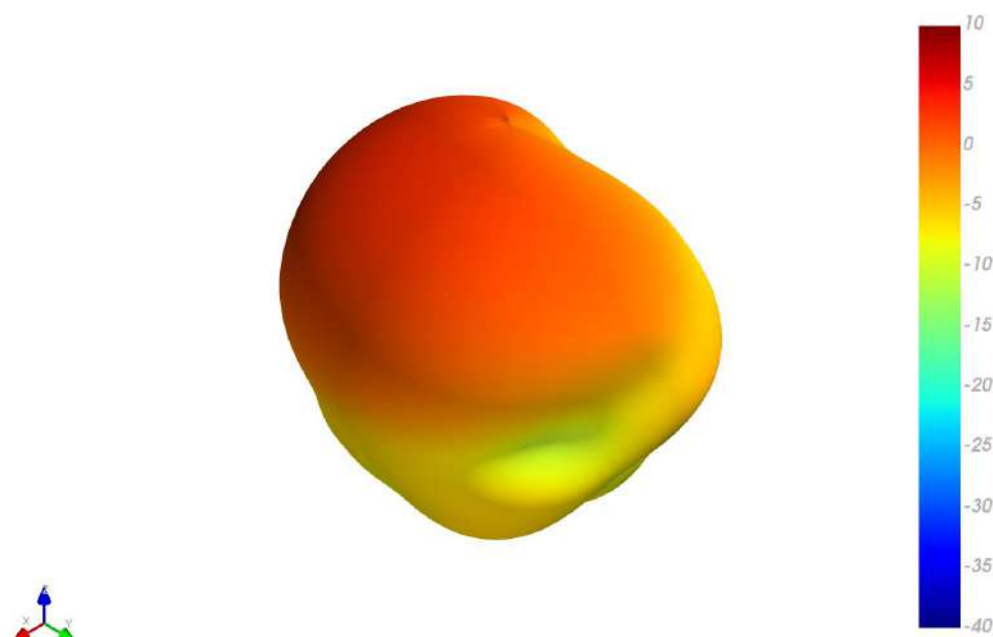


YZ Plane

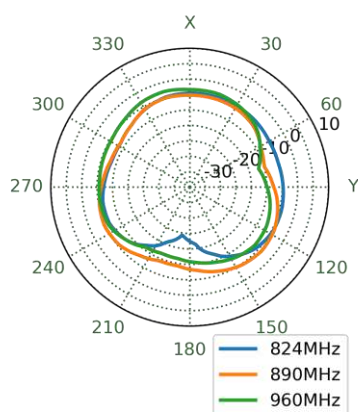




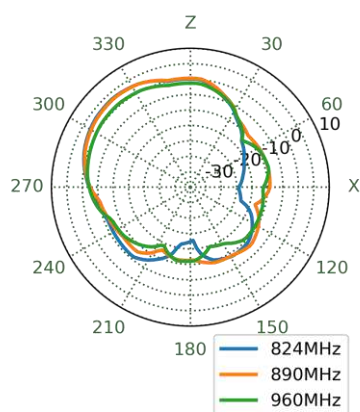
890MHz



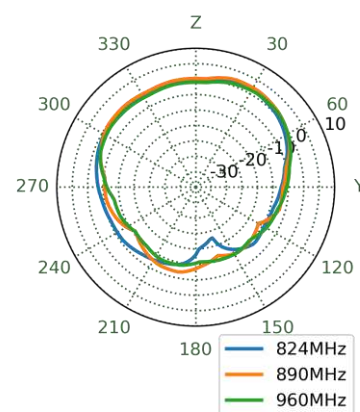
XY Plane



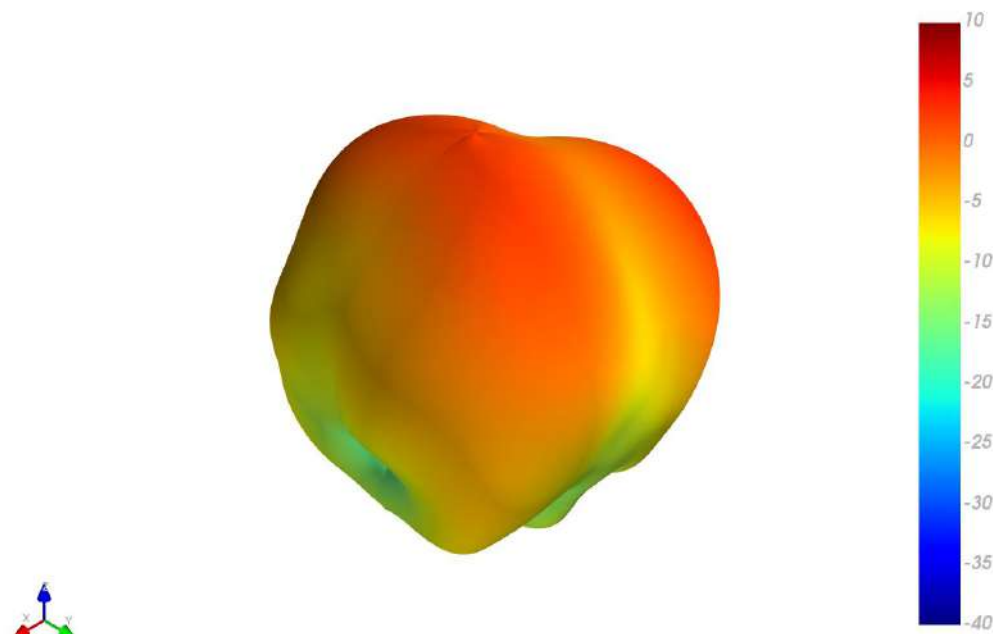
XZ Plane



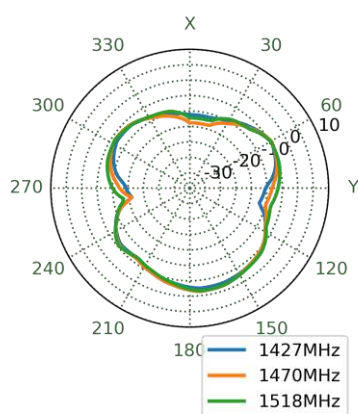
YZ Plane



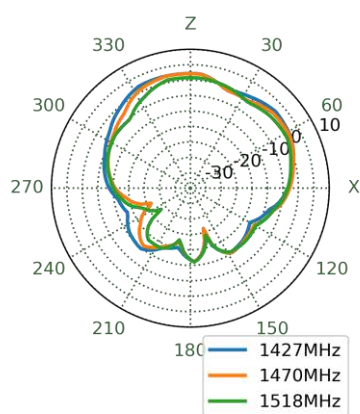
1470MHz



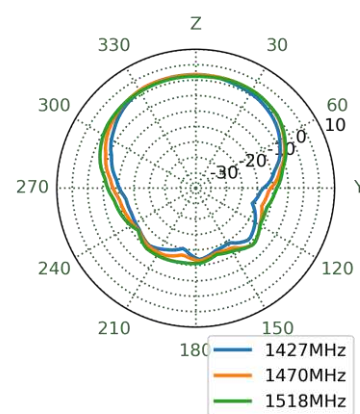
XY Plane



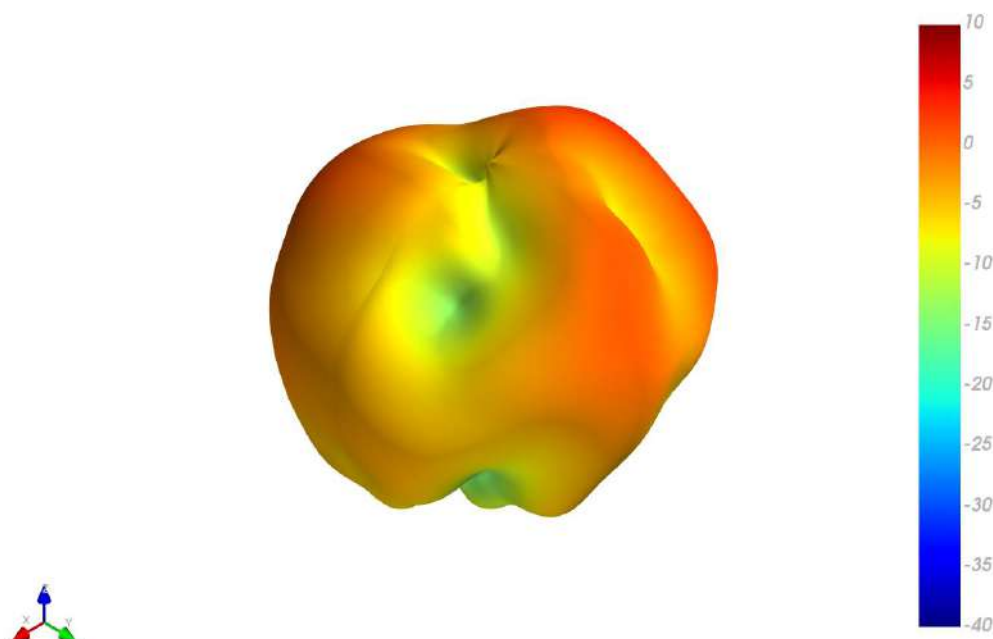
XZ Plane



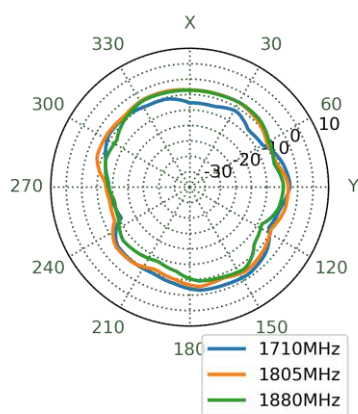
YZ Plane



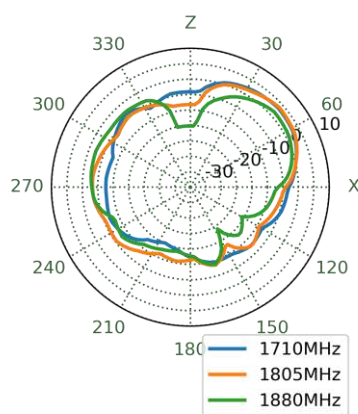
1805MHz



XY Plane



XZ Plane



YZ Plane

