

Antenna Test Report

The gain of each antenna is measured in a fully anechoic chamber certified by CTIA OTA. The individual gains of all antennas are then mathematically summed at the same spatial position (azimuth and elevation) across all points in a spherical antenna pattern, following the FCC KDB 662911 D01 guidelines to compute the directional antenna gain.

1. General Information of Equipment Under Test

Equipment	Wireless Access Point
Brand Name	Vantiva USA LLC
Model Name	XB10
Applicant	Vantiva USA LLC
Manufacturer	Vantiva USA LLC

2. Test Location

Test Site	Sporton International Inc. (Taiwan)
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)
Test Site No.	Sporton Site No.
	OTA03-HY

Test Method	Test Engineer	Environment (°C / %)	Test Date
Radiated	otis	24~25 / 42~50	Nov. 12, 2024~Dec. 30, 2024

3. Test Frequency

Band (MHz)	Test Frequency (MHz)
2400-2480	2400, 2437, 2480
5150-5250	5170, 5180, 5190, 5200, 5210, 5220, 5230, 5240, 5250
5250-5350	5250, 5260, 5270, 5280, 5290, 5300, 5310, 5320, 5330
5470-5725	5490, 5500, 5510, 5520, 5530, 5540, 5550, 5560, 5570, 5580, 5590, 5600, 5610, 5620, 5630, 5640, 5650, 5660, 5670, 5680, 5690, 5700, 5710, 5720
5725-5850	5730, 5735, 5745, 5755, 5765, 5775, 5785, 5795, 5805, 5815, 5825, 5835
5850-5895	5850, 5865, 5895
5925-6425	5925, 6200, 6425
6425-6525	6425, 6500, 6525
6525-6875	6525, 6700, 6750, 6875
6875-7125	6875, 7000, 7050, 7125

4. Antenna Information

Ant. Position	Brand Name	Model Name	Ant. Type	Connector
Antenna #1 (WLAN 6G)	Airgain	N06CTANG-PK1-LB1X80BU	Monopole	U.FL
Antenna #2 (WLAN 6G)	Airgain	N06CTANH-PK1-LP1X135BU	Monopole	U.FL
Antenna #3 (WLAN 6G)	Airgain	N06CTANE-PK1-LG1X180BU	Monopole	U.FL
Antenna #4 (WLAN 6G)	Airgain	N06CTANF-PK1-LW1X125BU	Monopole	U.FL
Antenna #5 (WLAN 2.4G/5G)	Airgain	N03CTAND-PK1-Y1X205BU	Dipole	U.FL
Antenna #6 (WLAN 2.4G/5G)	Airgain	N03CTANR-PK1-B1X150BU	Dipole	U.FL
Antenna #7 (WLAN 2.4G/5G)	Airgain	N03CTANS-PK1-A1X240BU	Dipole	U.FL
Antenna #8 (WLAN 2.4G/5G)	Airgain	N03CTANA-PK1-R1X215BU	Dipole	U.FL
Antenna #9 (ZIGBEE)	Airgain	N01CTANJ-PK1-B1X230BU	Dipole	U.FL
Antenna #10 (ZIGBEE)	Airgain	N01CTANK-PK1-Q1X245BU	Dipole	U.FL
Antenna #11 (BLE)	Airgain	PCB Antenna	Monopole	NA

5. Test Results:

5.1 Individual Antenna Gain

Maximum Antenna Gain for individual antenna				
Antenna	Frequency (MHz)	Antenna gain (dBi)	Theta	Phi
#1	5925MHz	5.31(dBi)	45	165
#1	6200MHz	4.97(dBi)	45	170
#1	6425MHz	4.64(dBi)	45	170
#1	6500MHz	5.21(dBi)	45	170
#1	6525MHz	5.73(dBi)	45	175
#1	6700MHz	5.47(dBi)	50	170
#1	6750MHz	5.68(dBi)	50	170
#1	6875MHz	5.3(dBi)	50	175
#1	7000MHz	5.27(dBi)	45	150
#1	7050MHz	5.48(dBi)	45	155
#1	7125MHz	5.54(dBi)	45	155
#2	5925MHz	3.83(dBi)	70	65
#2	6200MHz	4.65(dBi)	70	55
#2	6425MHz	5.27(dBi)	70	65
#2	6500MHz	5.65(dBi)	70	65
#2	6525MHz	6.04(dBi)	70	65
#2	6700MHz	5.77(dBi)	75	70
#2	6750MHz	6.21(dBi)	75	70
#2	6875MHz	6.45(dBi)	75	75
#2	7000MHz	5.66(dBi)	70	70
#2	7050MHz	5.59(dBi)	70	70
#2	7125MHz	5.5(dBi)	70	70

Maximum Antenna Gain for individual antenna				
#3	5925MHz	5.14(dBi)	55	345
#3	6200MHz	5.84(dBi)	45	305
#3	6425MHz	6.03(dBi)	55	350
#3	6500MHz	6.25(dBi)	55	350
#3	6525MHz	6.57(dBi)	60	345
#3	6700MHz	5.97(dBi)	25	335
#3	6750MHz	6.16(dBi)	30	330
#3	6875MHz	5.71(dBi)	30	335
#3	7000MHz	5.21(dBi)	30	335
#3	7050MHz	4.79(dBi)	30	340
#3	7125MHz	4.48(dBi)	35	340
#4	5925MHz	4.02(dBi)	30	205
#4	6200MHz	5.41(dBi)	40	210
#4	6425MHz	4.93(dBi)	50	185
#4	6500MHz	4.87(dBi)	50	185
#4	6525MHz	5.15(dBi)	55	190
#4	6700MHz	4.84(dBi)	50	215
#4	6750MHz	4.83(dBi)	50	220
#4	6875MHz	4.13(dBi)	45	230
#4	7000MHz	4.28(dBi)	55	225
#4	7050MHz	4.17(dBi)	55	230
#4	7125MHz	4.58(dBi)	55	200

Maximum Antenna Gain for individual antenna				
#5	2400MHz	2.31(dBi)	65	145
#5	2437MHz	3.08(dBi)	65	140
#5	2480MHz	2.25(dBi)	50	210
#5	5170MHz	4.1(dBi)	60	190
#5	5180MHz	4.08(dBi)	60	190
#5	5190MHz	4.18(dBi)	60	190
#5	5200MHz	4.18(dBi)	60	190
#5	5210MHz	4.17(dBi)	60	190
#5	5220MHz	4.26(dBi)	60	190
#5	5230MHz	4.29(dBi)	50	190
#5	5240MHz	4.29(dBi)	50	190
#5	5250MHz	4.27(dBi)	50	190
#5	5260MHz	4.16(dBi)	50	190
#5	5270MHz	4.09(dBi)	50	190
#5	5280MHz	4.1(dBi)	50	190
#5	5290MHz	4.04(dBi)	50	190
#5	5300MHz	4.02(dBi)	50	190
#5	5310MHz	3.91(dBi)	50	190
#5	5320MHz	3.75(dBi)	50	190
#5	5330MHz	3.79(dBi)	50	190
#5	5490MHz	3.25(dBi)	60	185
#5	5500MHz	3.45(dBi)	60	185
#5	5510MHz	3.64(dBi)	60	185
#5	5520MHz	3.91(dBi)	60	185
#5	5530MHz	4.08(dBi)	60	180
#5	5540MHz	4.12(dBi)	60	180
#5	5550MHz	4.19(dBi)	60	180
#5	5560MHz	4.15(dBi)	60	175
#5	5570MHz	4.29(dBi)	60	175
#5	5580MHz	4.4(dBi)	60	175
#5	5590MHz	4.41(dBi)	60	175
#5	5600MHz	4.3(dBi)	60	175
#5	5610MHz	4.3(dBi)	60	175

Maximum Antenna Gain for individual antenna				
#5	5620MHz	4.27(dBi)	60	170
#5	5630MHz	4.28(dBi)	60	170
#5	5640MHz	4.27(dBi)	60	170
#5	5650MHz	4.25(dBi)	10	170
#5	5660MHz	4.35(dBi)	10	170
#5	5670MHz	4.34(dBi)	10	170
#5	5680MHz	4.29(dBi)	10	165
#5	5690MHz	4.23(dBi)	10	165
#5	5700MHz	3.99(dBi)	50	165
#5	5710MHz	3.99(dBi)	50	165
#5	5720MHz	4.04(dBi)	50	165
#5	5730MHz	3.92(dBi)	50	165
#5	5735MHz	3.93(dBi)	50	160
#5	5745MHz	3.91(dBi)	55	160
#5	5755MHz	3.87(dBi)	55	160
#5	5765MHz	3.83(dBi)	55	160
#5	5775MHz	3.82(dBi)	55	160
#5	5785MHz	3.74(dBi)	55	160
#5	5795MHz	3.67(dBi)	55	160
#5	5805MHz	3.74(dBi)	55	160
#5	5815MHz	3.77(dBi)	55	160
#5	5825MHz	3.74(dBi)	55	160
#5	5835MHz	3.73(dBi)	65	170
#5	5850MHz	4.66(dBi)	55	180
#5	5865MHz	4.36(dBi)	55	175
#5	5895MHz	3.94(dBi)	45	175
#6	2400MHz	1.6(dBi)	125	120
#6	2437MHz	2.58(dBi)	130	115
#6	2480MHz	2.87(dBi)	125	120
#6	5170MHz	4.69(dBi)	50	355
#6	5180MHz	4.63(dBi)	50	355
#6	5190MHz	4.64(dBi)	50	355
#6	5200MHz	4.53(dBi)	50	355

Maximum Antenna Gain for individual antenna				
#6	5210MHz	4.5(dBi)	50	355
#6	5220MHz	4.55(dBi)	55	350
#6	5230MHz	4.63(dBi)	50	350
#6	5240MHz	4.63(dBi)	50	350
#6	5250MHz	4.66(dBi)	55	350
#6	5260MHz	4.59(dBi)	55	350
#6	5270MHz	4.53(dBi)	50	350
#6	5280MHz	4.58(dBi)	55	350
#6	5290MHz	4.55(dBi)	55	345
#6	5300MHz	4.53(dBi)	55	345
#6	5310MHz	4.42(dBi)	55	345
#6	5320MHz	4.31(dBi)	55	345
#6	5330MHz	4.39(dBi)	55	345
#6	5490MHz	4.32(dBi)	35	350
#6	5500MHz	4.24(dBi)	35	345
#6	5510MHz	4.26(dBi)	35	345
#6	5520MHz	4.29(dBi)	35	345
#6	5530MHz	4.27(dBi)	45	340
#6	5540MHz	4.09(dBi)	45	340
#6	5550MHz	4.01(dBi)	35	350
#6	5560MHz	4.02(dBi)	35	350
#6	5570MHz	4.12(dBi)	35	350
#6	5580MHz	4.3(dBi)	35	350
#6	5590MHz	4.51(dBi)	35	350
#6	5600MHz	4.62(dBi)	35	350
#6	5610MHz	4.86(dBi)	35	350
#6	5620MHz	4.96(dBi)	35	350
#6	5630MHz	5.05(dBi)	35	350
#6	5640MHz	5.14(dBi)	35	345
#6	5650MHz	5.22(dBi)	35	345
#6	5660MHz	5.36(dBi)	35	345
#6	5670MHz	5.45(dBi)	35	345
#6	5680MHz	5.44(dBi)	35	345

Maximum Antenna Gain for individual antenna				
#6	5690MHz	5.44(dBi)	35	345
#6	5700MHz	5.27(dBi)	35	340
#6	5710MHz	5.2(dBi)	35	340
#6	5720MHz	5.19(dBi)	35	340
#6	5730MHz	5.03(dBi)	35	340
#6	5735MHz	4.96(dBi)	35	340
#6	5745MHz	4.82(dBi)	35	340
#6	5755MHz	4.72(dBi)	35	340
#6	5765MHz	4.57(dBi)	35	340
#6	5775MHz	4.49(dBi)	35	340
#6	5785MHz	4.33(dBi)	35	335
#6	5795MHz	4.21(dBi)	35	335
#6	5805MHz	4.25(dBi)	35	335
#6	5815MHz	4.19(dBi)	35	335
#6	5825MHz	4.02(dBi)	40	335
#6	5835MHz	3.85(dBi)	55	45
#6	5850MHz	3.86(dBi)	55	280
#6	5865MHz	3.57(dBi)	55	280
#6	5895MHz	3.71(dBi)	70	360

Maximum Antenna Gain for individual antenna				
#7	2400MHz	4.77(dBi)	95	115
#7	2437MHz	3.39(dBi)	80	0
#7	2480MHz	4.12(dBi)	75	25
#7	5170MHz	3.65(dBi)	70	280
#7	5180MHz	3.72(dBi)	70	280
#7	5190MHz	3.86(dBi)	70	280
#7	5200MHz	3.88(dBi)	70	280
#7	5210MHz	3.89(dBi)	70	280
#7	5220MHz	3.94(dBi)	75	280
#7	5230MHz	4.06(dBi)	75	280
#7	5240MHz	4.08(dBi)	75	280
#7	5250MHz	4.03(dBi)	75	280
#7	5260MHz	4.07(dBi)	80	320
#7	5270MHz	4.19(dBi)	80	320
#7	5280MHz	4.37(dBi)	80	320
#7	5290MHz	4.42(dBi)	80	320
#7	5300MHz	4.42(dBi)	80	320
#7	5310MHz	4.31(dBi)	80	320
#7	5320MHz	4.17(dBi)	80	320
#7	5330MHz	4.17(dBi)	80	320
#7	5490MHz	3.97(dBi)	75	260
#7	5500MHz	3.95(dBi)	80	260
#7	5510MHz	4.08(dBi)	80	260
#7	5520MHz	4.23(dBi)	80	260
#7	5530MHz	4.3(dBi)	80	260
#7	5540MHz	4.21(dBi)	80	260
#7	5550MHz	4.11(dBi)	80	260
#7	5560MHz	4.08(dBi)	75	255
#7	5570MHz	4.12(dBi)	75	255
#7	5580MHz	4.15(dBi)	75	255
#7	5590MHz	4.2(dBi)	75	255
#7	5600MHz	4.14(dBi)	75	255
#7	5610MHz	4.24(dBi)	75	255

Maximum Antenna Gain for individual antenna				
#7	5620MHz	4.27(dBi)	75	255
#7	5630MHz	4.29(dBi)	75	255
#7	5640MHz	4.37(dBi)	75	255
#7	5650MHz	4.41(dBi)	75	255
#7	5660MHz	4.5(dBi)	75	255
#7	5670MHz	4.54(dBi)	75	255
#7	5680MHz	4.55(dBi)	75	255
#7	5690MHz	4.6(dBi)	75	255
#7	5700MHz	4.46(dBi)	75	255
#7	5710MHz	4.41(dBi)	75	255
#7	5720MHz	4.38(dBi)	75	255
#7	5730MHz	4.34(dBi)	75	250
#7	5735MHz	4.34(dBi)	75	250
#7	5745MHz	4.33(dBi)	75	250
#7	5755MHz	4.31(dBi)	75	250
#7	5765MHz	4.25(dBi)	75	250
#7	5775MHz	4.26(dBi)	75	250
#7	5785MHz	4.14(dBi)	75	250
#7	5795MHz	4.05(dBi)	75	250
#7	5805MHz	4.05(dBi)	75	290
#7	5815MHz	4.24(dBi)	75	290
#7	5825MHz	4.27(dBi)	75	290
#7	5835MHz	4.23(dBi)	75	290
#7	5850MHz	5.18(dBi)	70	290
#7	5865MHz	5.15(dBi)	70	290
#7	5895MHz	5.04(dBi)	75	295
#8	2400MHz	2.49(dBi)	85	75
#8	2437MHz	3.13(dBi)	95	85
#8	2480MHz	4.03(dBi)	90	70
#8	5170MHz	3.93(dBi)	80	70
#8	5180MHz	3.75(dBi)	80	70
#8	5190MHz	3.74(dBi)	80	70
#8	5200MHz	3.73(dBi)	85	70

Maximum Antenna Gain for individual antenna				
#8	5210MHz	3.82(dBi)	85	70
#8	5220MHz	3.9(dBi)	85	70
#8	5230MHz	4(dBi)	85	70
#8	5240MHz	3.94(dBi)	85	70
#8	5250MHz	3.85(dBi)	80	70
#8	5260MHz	3.76(dBi)	85	70
#8	5270MHz	3.75(dBi)	80	65
#8	5280MHz	3.81(dBi)	80	65
#8	5290MHz	3.79(dBi)	80	65
#8	5300MHz	3.77(dBi)	80	65
#8	5310MHz	3.71(dBi)	80	65
#8	5320MHz	3.62(dBi)	80	65
#8	5330MHz	3.71(dBi)	80	65
#8	5490MHz	3.64(dBi)	85	135
#8	5500MHz	3.58(dBi)	85	135
#8	5510MHz	3.62(dBi)	85	130
#8	5520MHz	3.72(dBi)	85	130
#8	5530MHz	3.71(dBi)	85	130
#8	5540MHz	3.62(dBi)	90	65
#8	5550MHz	3.67(dBi)	85	65
#8	5560MHz	3.72(dBi)	85	65
#8	5570MHz	3.86(dBi)	85	65
#8	5580MHz	4.06(dBi)	85	65
#8	5590MHz	4.25(dBi)	85	65
#8	5600MHz	4.3(dBi)	85	65
#8	5610MHz	4.45(dBi)	85	65
#8	5620MHz	4.46(dBi)	85	65
#8	5630MHz	4.51(dBi)	85	65
#8	5640MHz	4.55(dBi)	85	65
#8	5650MHz	4.56(dBi)	85	65
#8	5660MHz	4.72(dBi)	90	70
#8	5670MHz	4.87(dBi)	90	70
#8	5680MHz	4.95(dBi)	90	70

Maximum Antenna Gain for individual antenna				
#8	5690MHz	5.01(dBi)	90	70
#8	5700MHz	4.9(dBi)	90	70
#8	5710MHz	4.85(dBi)	90	70
#8	5720MHz	4.84(dBi)	90	70
#8	5730MHz	4.71(dBi)	85	65
#8	5735MHz	4.68(dBi)	85	65
#8	5745MHz	4.59(dBi)	85	65
#8	5755MHz	4.51(dBi)	85	65
#8	5765MHz	4.43(dBi)	85	65
#8	5775MHz	4.42(dBi)	85	65
#8	5785MHz	4.23(dBi)	85	65
#8	5795MHz	4.17(dBi)	85	65
#8	5805MHz	4.2(dBi)	85	65
#8	5815MHz	4.26(dBi)	85	65
#8	5825MHz	4.24(dBi)	85	65
#8	5835MHz	4.18(dBi)	85	65
#8	5850MHz	4.33(dBi)	90	70
#8	5865MHz	4.12(dBi)	90	70
#8	5895MHz	4.25(dBi)	90	70
#9	2400MHz	3.65(dBi)	30	205
#9	2437MHz	4.38(dBi)	35	200
#9	2480MHz	4.4(dBi)	35	195
#10	2400MHz	4.78(dBi)	40	90
#10	2437MHz	5.01(dBi)	35	295
#10	2480MHz	4.7(dBi)	45	95
#11	2402MHz	2.29(dBi)	65	85
#11	2440MHz	2.77(dBi)	65	80
#11	2480MHz	2.26(dBi)	65	80

5.2 Directional Antenna Gain

Directional gain						
Frequency (MHz)	5925	6200	6425	6500	6525	6700
Ant.#1 Gain (dBi)	-3.09	-8.2	-2.67	-1.69	5.73	0.32
Ant.#2 Gain (dBi)	-1.01	0.11	2.92	2.3	-8.54	0.72
Ant.#3 Gain (dBi)	-0.62	5.39	-2.02	-0.67	-6.98	2.33
Ant.#4 Gain (dBi)	2.59	-5.54	-0.6	-0.51	3.13	-1.43
(Theta, Phi)	25,275	60,340	40,110	40,110	45,175	15,0
Correlated directional gain (dBi)	5.73	5.55	5.71	6.01	6.43	6.61
Ant.#1 Gain (dBi)	-7.37	4.79	-26.36	5.12	5.73	5.34
Ant.#2 Gain (dBi)	1.44	-10.65	-0.32	-9.47	-8.54	-9.49
Ant.#3 Gain (dBi)	4.64	-12.37	6.03	-7.95	-6.98	-19.05
Ant.#4 Gain (dBi)	-6.26	2.82	-12.29	2.99	3.13	2.09
(Theta, Phi)	45,355	45,175	55,350	45,175	45,175	45,180
Uncorrelated directional gain (dBi)	0.72	1.03	0.97	1.4	1.86	1.11
Frequency (MHz)	6750	6875	7000	7050	7125	
Ant.#1 Gain (dBi)	0.93	-0.45	4.33	0.21	2.98	
Ant.#2 Gain (dBi)	1.64	-0.35	-5.76	3.57	-0.97	
Ant.#3 Gain (dBi)	2.02	3.76	1.68	-0.21	-1.7	
Ant.#4 Gain (dBi)	-0.89	-2.26	-2.43	-5.39	0.19	
(Theta, Phi)	15,360	20,355	55,65	90,55	90,95	
Correlated directional gain (dBi)	7.01	6.49	6.3	6.12	6.34	
Ant.#1 Gain (dBi)	-2.1	-2.25	4.33	0.21	0.79	
Ant.#2 Gain (dBi)	-3.06	6.45	-5.76	3.57	5.06	
Ant.#3 Gain (dBi)	6.01	-7.19	1.68	-0.21	-11.93	
Ant.#4 Gain (dBi)	-11.55	-11.6	-2.43	-5.39	-13.76	
(Theta, Phi)	25,340	75,75	55,65	90,55	80,70	
Uncorrelated directional gain (dBi)	1.12	1.2	0.99	0.57	0.52	

Frequency (MHz)	2400	2437	2480			
Ant.#5 Gain (dBi)	-13	-0.19	-1.51			
Ant.#6 Gain (dBi)	1.2	-1.56	-1.1			
Ant.#7 Gain (dBi)	4.34	2.14	2.31			
Ant.#8 Gain (dBi)	1.98	2.02	3.03			
(Theta, Phi)	100,100	85,140	80,50			
Correlated directional gain (dBi)	6.6	6.76	6.94			
Ant.#5 Gain (dBi)	-16.61	-21.02	-1.66			
Ant.#6 Gain (dBi)	1.28	1.22	-1.54			
Ant.#7 Gain (dBi)	4.63	3.36	2.06			
Ant.#8 Gain (dBi)	1.82	2.17	3.56			
(Theta, Phi)	100,105	100,105	80,55			
Uncorrelated directional gain (dBi)	1.6	1.1	1.19			
Frequency (MHz)	5170	5180	5190	5200	5210	5220
Ant.#5 Gain (dBi)	-0.94	-0.95	-0.8	-0.7	-0.61	-0.44
Ant.#6 Gain (dBi)	-6.5	-7.02	-7.29	-7.71	-7.8	-7.62
Ant.#7 Gain (dBi)	3.18	3.22	3.38	3.43	3.48	3.54
Ant.#8 Gain (dBi)	1.44	1.17	0.95	0.62	0.31	0.12
(Theta, Phi)	85,275	85,275	85,275	85,275	85,275	85,275
Correlated directional gain (dBi)	6	5.88	5.88	5.78	5.73	5.76
Ant.#5 Gain (dBi)	-22.76	-13.53	-13.74	-14.24	-14.9	-16.27
Ant.#6 Gain (dBi)	2.19	2.34	2.48	2.54	2.62	2.42
Ant.#7 Gain (dBi)	3.1	3.14	3.14	3.06	3.07	3.28
Ant.#8 Gain (dBi)	-0.55	-1.68	-1.75	-2	-2.18	-1.85
(Theta, Phi)	75,320	75,325	75,325	75,325	75,325	80,320
Uncorrelated directional gain (dBi)	0.59	0.51	0.55	0.5	0.51	0.56

Frequency (MHz)	5230	5240	5250	5260	5270	5280
Ant.#5 Gain (dBi)	-0.31	-0.48	0.25	-0.9	-1.56	-0.84
Ant.#6 Gain (dBi)	-7.21	-2.85	-4.74	-2.13	-2.05	-3.01
Ant.#7 Gain (dBi)	3.57	3.85	3.52	3.57	3.74	3.69
Ant.#8 Gain (dBi)	0.1	-3.11	-1.76	-2.85	-2.67	-2.26
(Theta, Phi)	85,275	70,275	85,270	70,275	75,270	75,275
Correlated directional gain (dBi)	5.85	5.85	5.86	5.83	5.8	5.84
Ant.#5 Gain (dBi)	-16.97	-17.57	-18.35	-19	-20.72	-23.26
Ant.#6 Gain (dBi)	2.44	2.33	2.17	1.96	1.77	1.7
Ant.#7 Gain (dBi)	3.58	3.75	3.95	4.07	4.19	4.37
Ant.#8 Gain (dBi)	-1.65	-1.48	-1.3	-1.21	-1.11	-0.98
(Theta, Phi)	80,320	80,320	80,320	80,320	80,320	80,320
Uncorrelated directional gain (dBi)	0.74	0.8	0.87	0.87	0.89	0.98
Frequency (MHz)	5290	5300	5310	5320	5330	5490
Ant.#5 Gain (dBi)	-0.9	-1.28	-1.52	-1.8	-1.89	-1.95
Ant.#6 Gain (dBi)	-2.72	-2.46	-2.15	-1.94	-1.69	-2.01
Ant.#7 Gain (dBi)	3.62	3.73	3.63	3.53	3.57	2.61
Ant.#8 Gain (dBi)	-2.05	-1.76	-1.7	-1.66	-1.5	-1.58
(Theta, Phi)	75,275	75,280	75,280	75,280	75,280	75,280
Correlated directional gain (dBi)	5.89	5.95	5.93	5.89	5.97	5.52
Ant.#5 Gain (dBi)	-27.89	-36.85	-43.57	-31.29	-26.1	-9.36
Ant.#6 Gain (dBi)	1.56	1.4	1.16	0.95	0.92	1.21
Ant.#7 Gain (dBi)	4.42	4.42	4.31	4.17	4.17	3.37
Ant.#8 Gain (dBi)	-0.91	-0.95	-1.01	-1.11	-1.09	-3.09
(Theta, Phi)	80,320	80,320	80,320	80,320	80,320	85,315
Uncorrelated directional gain (dBi)	0.98	0.93	0.79	0.64	0.63	0.1

Frequency (MHz)	5500	5510	5520	5530	5540	5550
Ant.#5 Gain (dBi)	-5.51	-5.27	-8.15	-4.28	-3.98	-3.6
Ant.#6 Gain (dBi)	1.54	1.5	1.56	1.6	1.61	1.72
Ant.#7 Gain (dBi)	1.69	1.97	4	2.55	2.57	2.64
Ant.#8 Gain (dBi)	-1.69	-1.55	-2.41	-1.14	-1.15	-1.11
(Theta, Phi)	70,310	70,310	85,315	70,310	70,310	70,310
Correlated directional gain (dBi)	5.49	5.63	5.87	6.09	6.14	6.27
Ant.#5 Gain (dBi)	-9.34	-8.86	-8.15	-7.48	-7.03	-6.6
Ant.#6 Gain (dBi)	1.31	1.41	1.56	1.54	1.44	1.4
Ant.#7 Gain (dBi)	3.49	3.73	4	4.08	3.98	3.88
Ant.#8 Gain (dBi)	-2.93	-2.7	-2.41	-2.16	-1.98	-1.8
(Theta, Phi)	85,315	85,315	85,315	85,315	85,315	85,315
Uncorrelated directional gain (dBi)	0.22	0.42	0.67	0.76	0.73	0.71
Frequency (MHz)	5560	5570	5580	5590	5600	5610
Ant.#5 Gain (dBi)	-3.32	-3.05	-2.79	-4.01	-3.98	-3.93
Ant.#6 Gain (dBi)	1.83	1.96	2.16	1.65	1.7	1.8
Ant.#7 Gain (dBi)	2.61	2.59	2.59	3.25	3.12	3.07
Ant.#8 Gain (dBi)	-1.18	-1.29	-1.4	-0.68	-0.78	-0.71
(Theta, Phi)	70,310	70,310	70,310	85,310	85,310	85,310
Correlated directional gain (dBi)	6.32	6.37	6.45	6.48	6.44	6.47
Ant.#5 Gain (dBi)	-5.02	-4.62	-4.27	-4.01	-3.98	-3.93
Ant.#6 Gain (dBi)	1.27	1.38	1.54	1.65	1.7	1.8
Ant.#7 Gain (dBi)	3.25	3.25	3.26	3.25	3.12	3.07
Ant.#8 Gain (dBi)	-0.63	-0.64	-0.67	-0.68	-0.78	-0.71
(Theta, Phi)	85,310	85,310	85,310	85,310	85,310	85,310
Uncorrelated directional gain (dBi)	0.64	0.69	0.77	0.82	0.76	0.79

Frequency (MHz)	5620	5630	5640	5650	5660	5670
Ant.#5 Gain (dBi)	-4.12	-4.39	-3.82	-4.04	-4.04	-4.06
Ant.#6 Gain (dBi)	1.78	1.74	1.72	1.64	1.68	1.52
Ant.#7 Gain (dBi)	2.9	2.74	2.27	2.16	2.19	2.17
Ant.#8 Gain (dBi)	-0.8	-0.89	-0.73	-0.83	-0.79	-0.88
(Theta, Phi)	85,310	85,310	75,305	75,305	75,305	75,305
Correlated directional gain (dBi)	6.35	6.23	6.19	6.08	6.11	6.03
Ant.#5 Gain (dBi)	1.48	1.24	1.22	1.06	1.04	1.02
Ant.#6 Gain (dBi)	4.96	5.05	5.14	5.22	5.36	5.45
Ant.#7 Gain (dBi)	-10.94	-10.18	-8.93	-8.12	-7.37	-6.88
Ant.#8 Gain (dBi)	-9.85	-9.79	-10.45	-10.43	-10.38	-10.74
(Theta, Phi)	35,350	35,350	35,345	35,345	35,345	35,345
Uncorrelated directional gain (dBi)	0.73	0.73	0.8	0.83	0.95	1.02
Frequency (MHz)	5680	5690	5700	5710	5720	5730
Ant.#5 Gain (dBi)	-4.16	-4.26	-4.47	-4.7	-4.85	-5.48
Ant.#6 Gain (dBi)	1.29	1.17	0.83	0.67	0.61	1
Ant.#7 Gain (dBi)	2.22	2.33	2.29	2.43	2.67	2.77
Ant.#8 Gain (dBi)	-0.97	-0.95	-1.13	-1.14	-1.14	-1.83
(Theta, Phi)	75,305	75,305	75,305	75,305	75,305	75,310
Correlated directional gain (dBi)	5.95	5.93	5.75	5.72	5.76	5.67
Ant.#5 Gain (dBi)	1.76	1.73	1.5	1.34	1.23	0.96
Ant.#6 Gain (dBi)	5.11	5.15	4.99	4.89	4.81	4.61
Ant.#7 Gain (dBi)	-7.03	-6.5	-6.29	-6.02	-5.81	-5.82
Ant.#8 Gain (dBi)	-9.85	-9.69	-9.77	-9.75	-9.46	-9.26
(Theta, Phi)	30,345	30,345	30,345	30,345	30,345	30,345
Uncorrelated directional gain (dBi)	1.01	1.05	0.89	0.8	0.73	0.54

Frequency (MHz)	5735	5745	5755	5765	5775	5785
Ant.#5 Gain (dBi)	-4.04	-5.65	-6.12	-4.48	-4.52	-4.73
Ant.#6 Gain (dBi)	0.98	0.27	0.23	-0.9	-0.76	-0.8
Ant.#7 Gain (dBi)	-5.23	2.93	2.96	-0.59	-0.49	-0.55
Ant.#8 Gain (dBi)	3.76	-1.25	-1.23	2.57	2.74	2.7
(Theta, Phi)	45,60	75,305	75,305	90,85	90,85	90,85
Correlated directional gain (dBi)	5.66	5.62	5.57	5.52	5.63	5.57
Ant.#5 Gain (dBi)	0.86	-4.02	-4.04	-4.2	-17.47	-7.81
Ant.#6 Gain (dBi)	4.54	0.91	0.75	0.5	-2.35	-1.32
Ant.#7 Gain (dBi)	-5.92	-5.44	-5.57	-5.73	-1.79	3.7
Ant.#8 Gain (dBi)	-9.12	3.74	3.73	3.65	4.42	-1.36
(Theta, Phi)	30,345	45,60	45,60	45,60	85,65	75,290
Uncorrelated directional gain (dBi)	0.45	0.29	0.23	0.09	0.03	-0.03
Frequency (MHz)	5795	5805	5815	5825	5835	5850
Ant.#5 Gain (dBi)	-4.99	-5.12	-5.3	-5.45	-5.5	-5.2
Ant.#6 Gain (dBi)	-0.85	-0.7	-0.65	-0.74	-0.84	-1.46
Ant.#7 Gain (dBi)	-0.56	-0.4	-0.34	-0.38	-0.51	5.12
Ant.#8 Gain (dBi)	2.74	2.98	3.16	3.21	3.22	-3.57
(Theta, Phi)	90,85	90,85	90,85	90,85	90,85	75,295
Correlated directional gain (dBi)	5.53	5.67	5.74	5.71	5.65	5.72
Ant.#5 Gain (dBi)	-8.56	-8.99	-9.33	-9.64	-10.1	-7.41
Ant.#6 Gain (dBi)	-1.22	-0.97	-0.71	-0.55	-0.38	0.53
Ant.#7 Gain (dBi)	3.81	4.05	4.24	4.27	4.23	5.12
Ant.#8 Gain (dBi)	-1.51	-1.58	-1.62	-1.86	-2.16	-6.45
(Theta, Phi)	75,290	75,290	75,290	75,290	75,290	70,295
Uncorrelated directional gain (dBi)	0	0.17	0.33	0.33	0.29	0.78

Frequency (MHz)	5865	5895				
Ant.#5 Gain (dBi)	-9.34	-6.97				
Ant.#6 Gain (dBi)	-1.22	-1.71				
Ant.#7 Gain (dBi)	0.54	5.04				
Ant.#8 Gain (dBi)	3.65	-4.38				
(Theta, Phi)	95,75	75,295				
Correlated directional gain (dBi)	5.57	5.25				
Ant.#5 Gain (dBi)	-6.27	-6.97				
Ant.#6 Gain (dBi)	-1.73	-1.71				
Ant.#7 Gain (dBi)	5.14	5.04				
Ant.#8 Gain (dBi)	-3.76	-4.38				
(Theta, Phi)	75,295	75,295				
Uncorrelated directional gain (dBi)	0.6	0.44				

The composite gain of the antenna is calculated using the formula in clause F)2)d)i) of KDB 662911 D01 v02r01, which determines the measured directional gain at the same spatial position (Theta, Phi) after measuring each individual antenna.

The F)2)d)i) and F)2)d)ii) of KDB 662911 D01 v02r01:

d) *Unequal antenna gains, with equal transmit powers.* For antenna gains given by $G_1, G_2, \dots, G_N$ dBi

(i) If transmit signals are *correlated*, then

Directional gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}]$ dBi [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

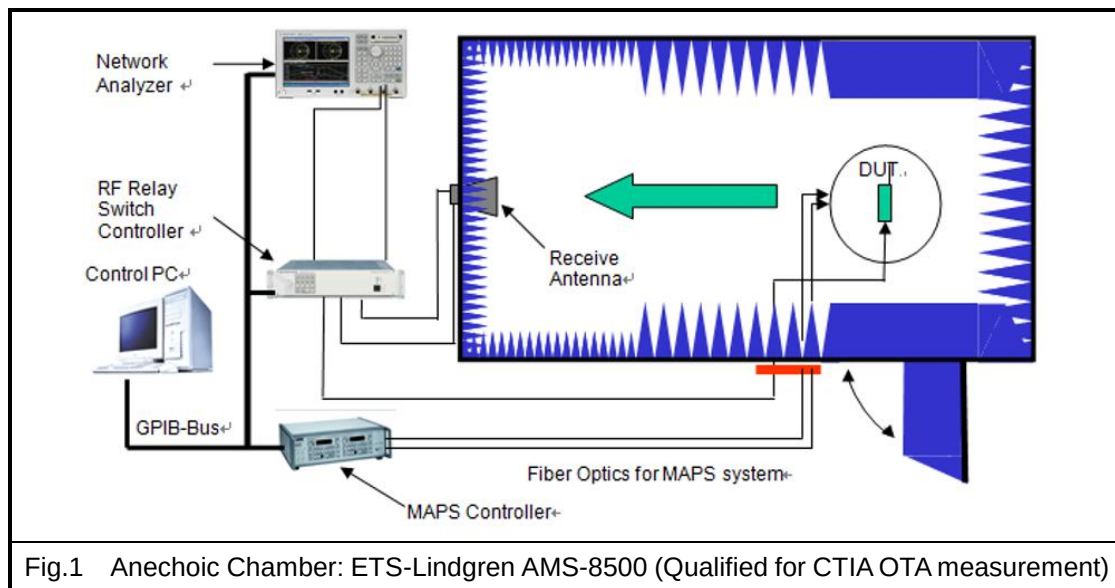
(ii) If all transmit signals are *completely uncorrelated*, then

Directional gain = $10 \log[(10^{G_1/10} + 10^{G_2/10} + \dots + 10^{G_N/10}) / N_{ANT}]$ dBi

6. Radiated Measurement Method and Environment:

The directional gain is measured using a gain-comparison method, with the antenna under test positioned inside an anechoic chamber that meets the following specifications:

- Overall dimensions (L x W x H) : 7.5m x 3.9m x 3.9m (rectangular chamber)
- Antenna measured frequency range: 700MHz to 10GHz
- Quiet zone (cylindrical volume): diameter: 50cm, height: 36cm



6.1 Radiated Test Procedure:

- i. This test procedure primarily adheres to Section 3 of the CTIA Test Plan [1], which outlines the scope of measurement. The total range loss—comprising air loss, receiving antenna loss, and cable loss—has been pre-calibrated by comparing it with a calibrated antenna (ETS-Lindgren Sleeve dipole and horn antenna 3117). While conducting the radiated test on the Device Under Test (DUT), the total range loss has been taken into account for final results.
- ii. The Device Under Test (DUT) is positioned on a three-dimensional (3D) fixture constructed from low-dielectric material. One of the DUT's antennas is connected to the network analyzer, while the input port of the other antenna is properly terminated.
- iii. A three-dimensional characterization of the antenna performance of the DUT is pieced together by analyzing the data from the spatially distributed measurements. Data points taken every 5 degrees in the theta and in the phi axes are deemed sufficient to fully characterize the DUT's Far-Field radiation pattern and total radiated power.
- iv. The antenna gain is reported in Section 5.1 of this document and antenna patterns in Appendix A, respectively.
- v. Repeatedly test the other antenna by following the step iii to step v.
- vi. Once the individual antenna gains have been measured, the directional antenna gain is calculated using clauses F)2)d)i) and F)2)d)ii) of FCC KDB 662911 D01. In this process, the gains of all antennas are mathematically summed at the same azimuth and elevation position. The resulting superposition of the measured directional gains is reported in Section 5.2 of this document, while the antenna patterns can be found in Appendix A.



Fig.2 Test Chamber – Network Analyzer

6.2 Test Equipment:

OTA03-HY					
Instrument	Brand Name	Type/Model	Serial Number	Last Cal.	Due Date
ENA Series Network Analyzer	Keysight	E5071C	MY46101588	2024/11/12	2025/11/11
RF Switch	ETS	EMCENTER	00251467	NCR	NCR
Multi-Axis Positioner Controller	ETS-Lindgren	2090	N/A	NCR	NCR
Medium-Duty Positioner	ETS-Lindgren	2015	N/A	NCR	NCR
Measurement Horn Antenna	EMCO	3164-08	00086722	NCR	NCR

Note: NCR means No Calibration Required.

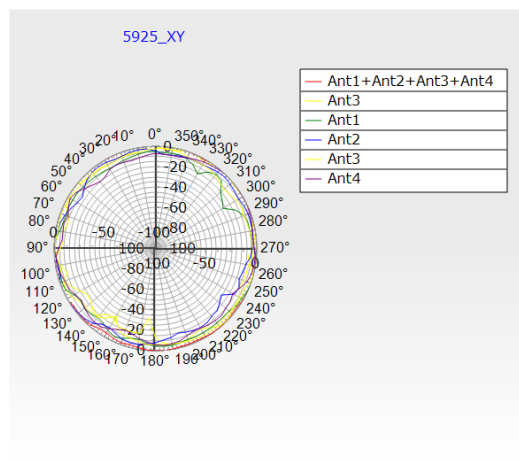
7. References

1. CTIA Test Plan for Wireless Device Over-the-Air Performance Version 3.7
2. FCC KDB 662911 D01 MIMO Antenna Gain Measurement

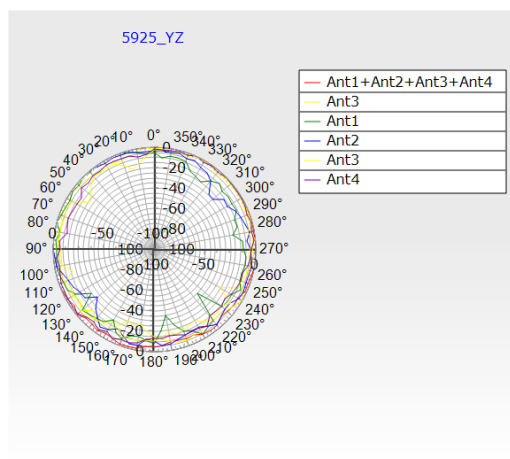
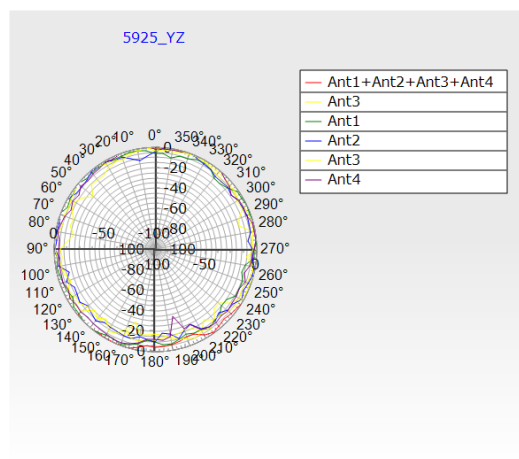
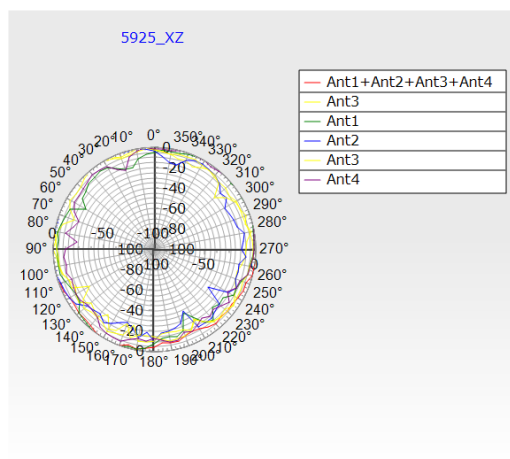
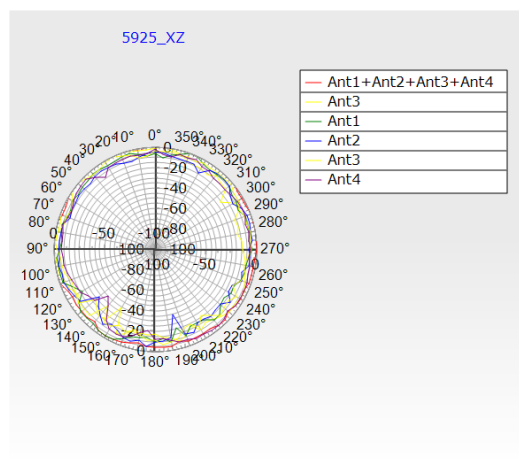
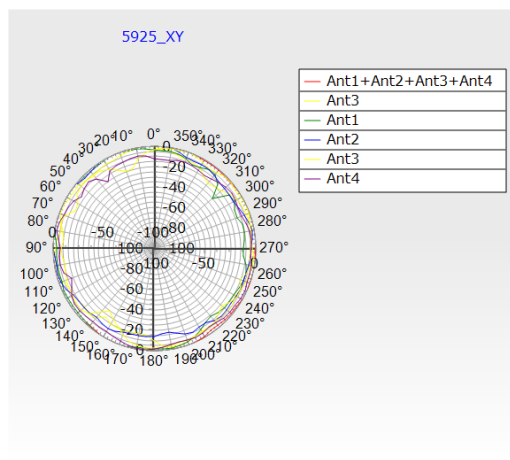
Appendix A. 2D Patterns

6GHz Ant #1, Ant #2, Ant #3, Ant #4 and Ant ((#1 + #2 + #3 + #4) Corr. DG:

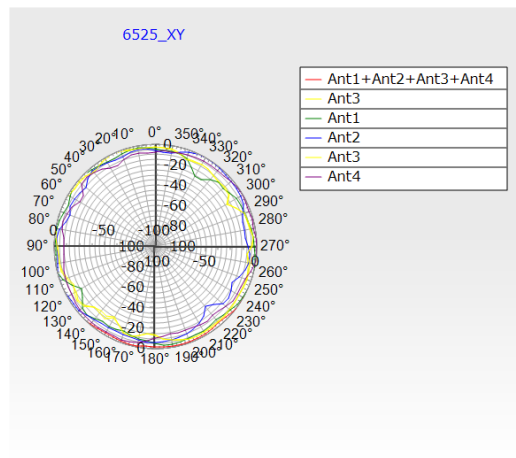
Phi_5925MHz



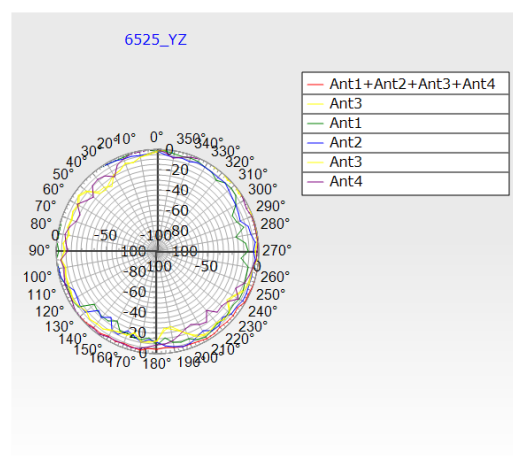
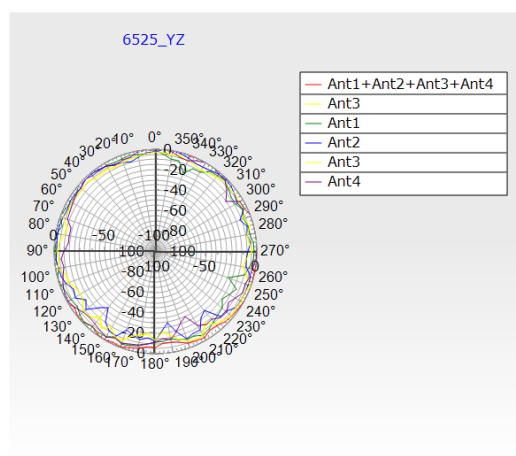
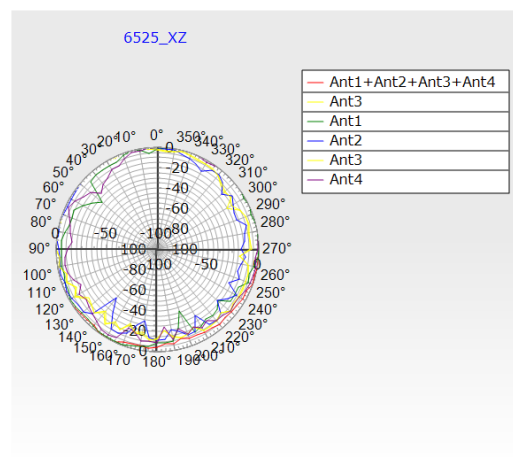
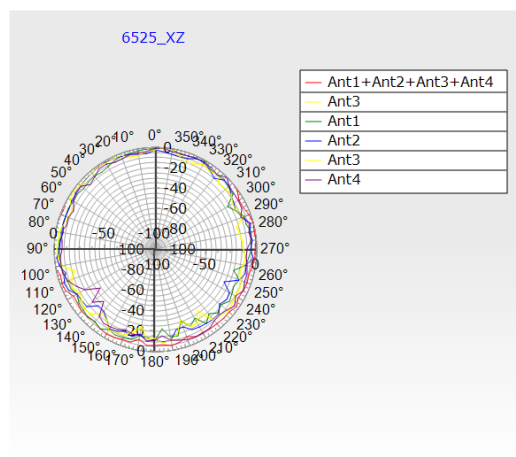
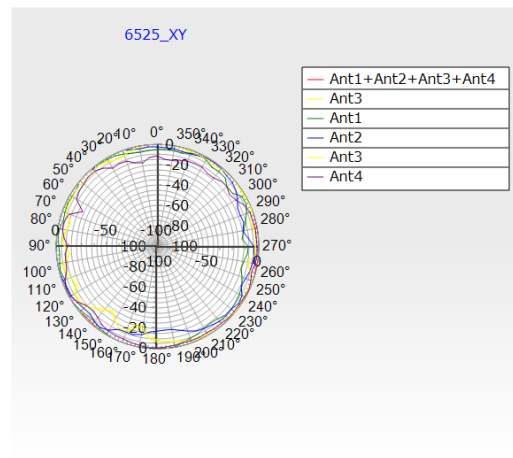
Theta_5925MHz



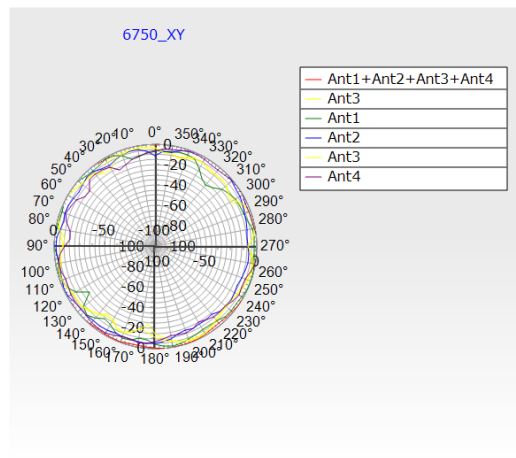
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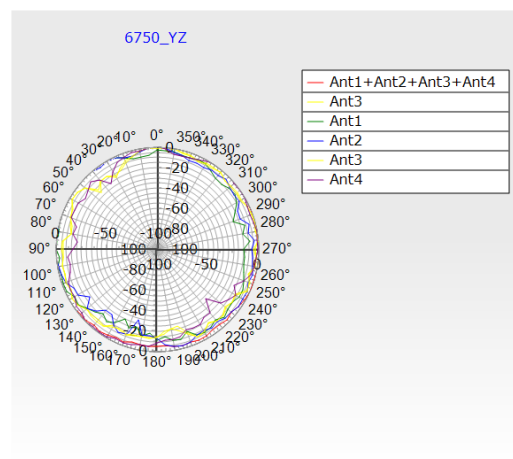
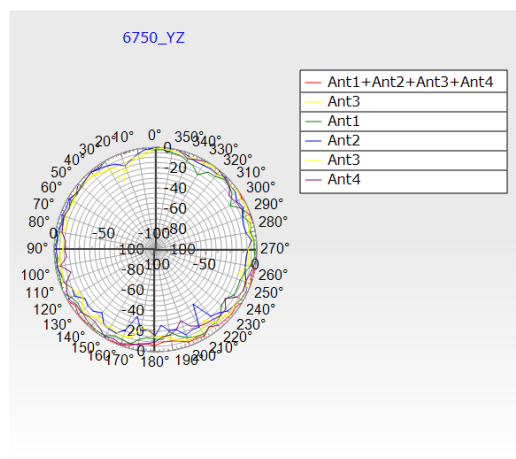
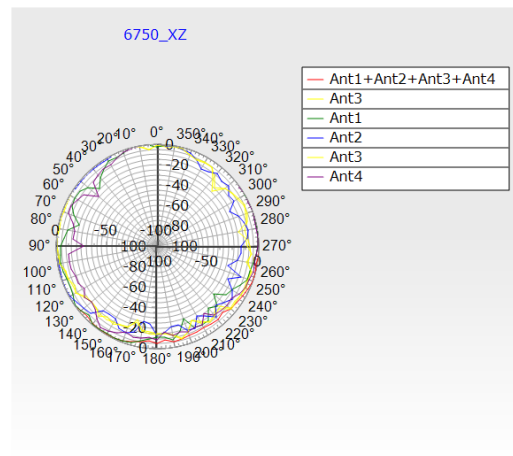
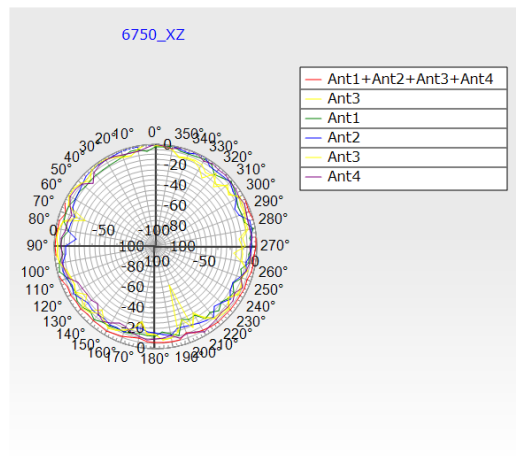
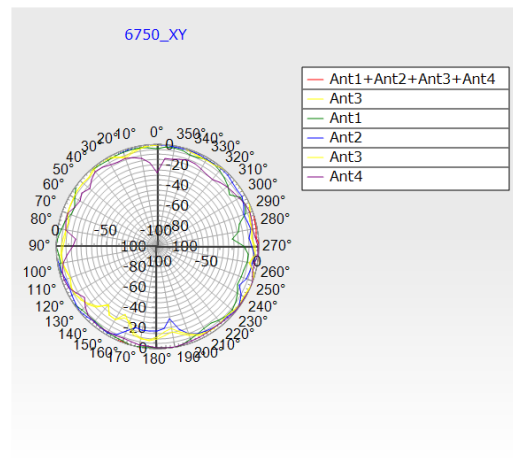
Theta_6525MHz



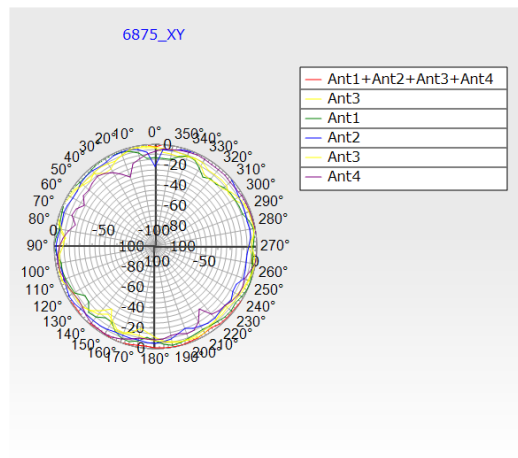
Phi_6750MHz



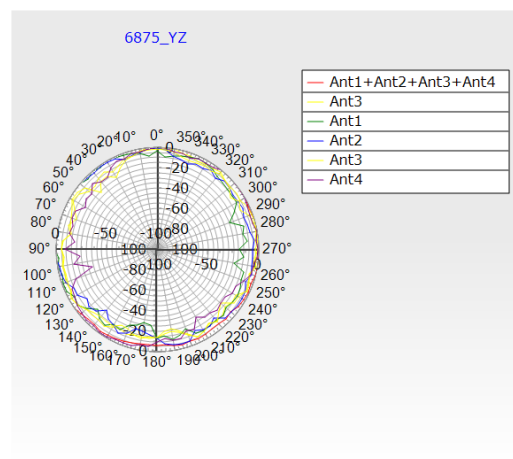
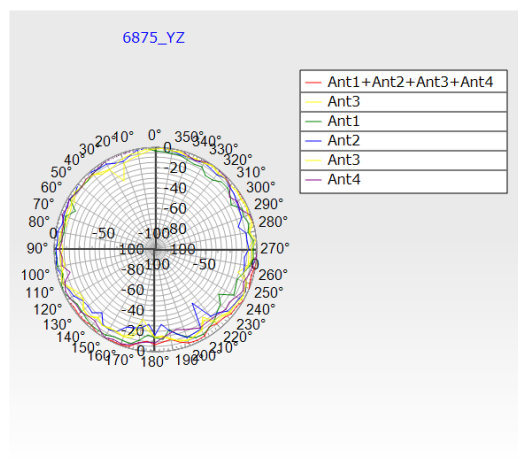
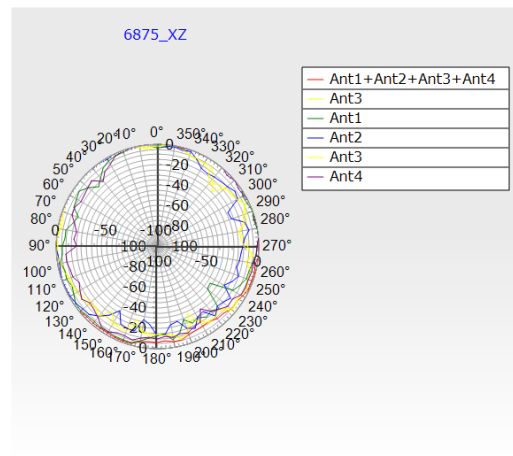
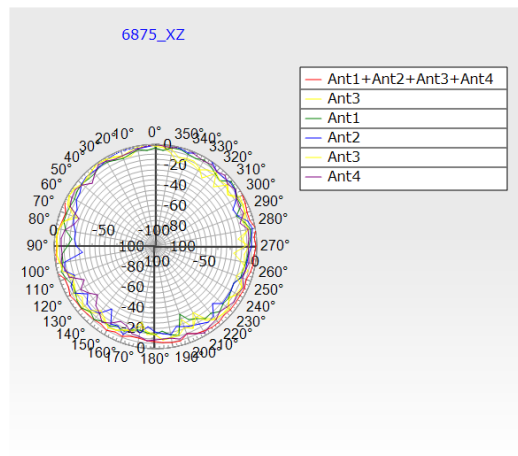
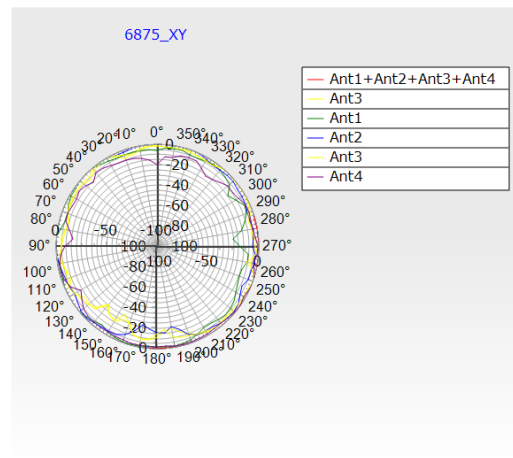
Theta_6750MHz



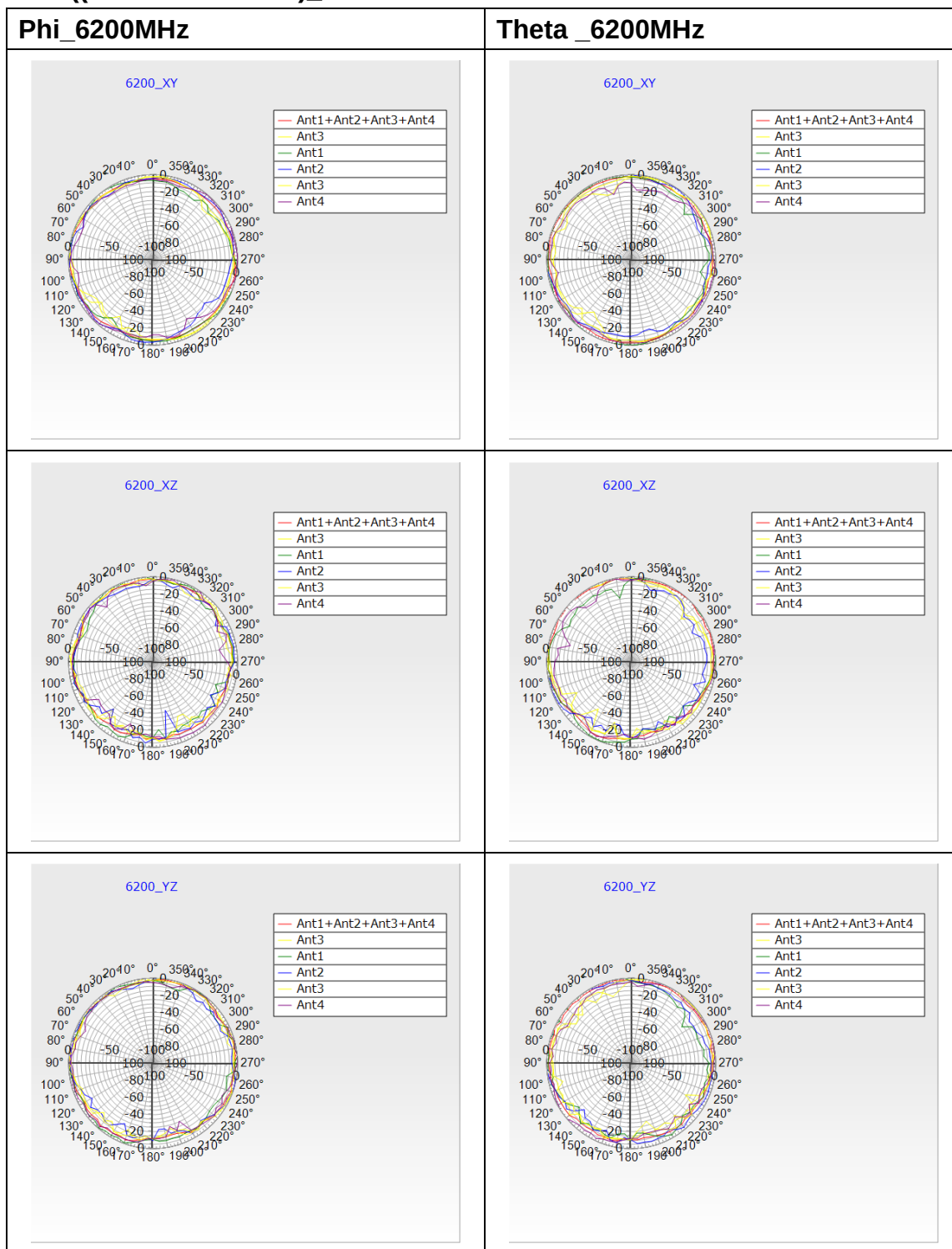
Phi_6875MHz



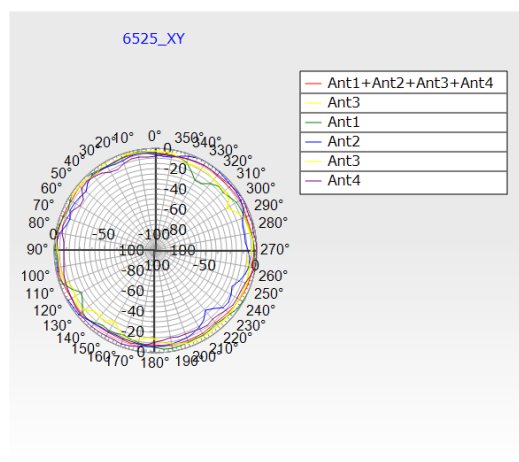
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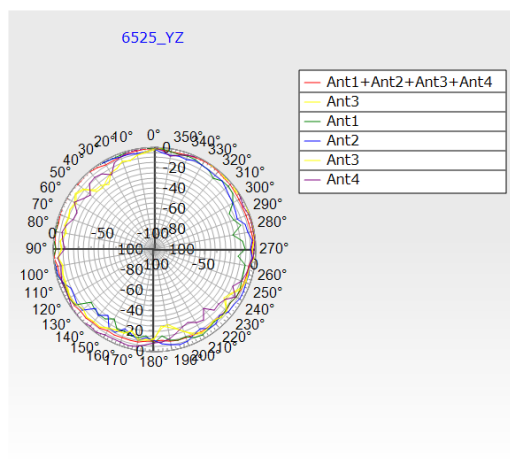
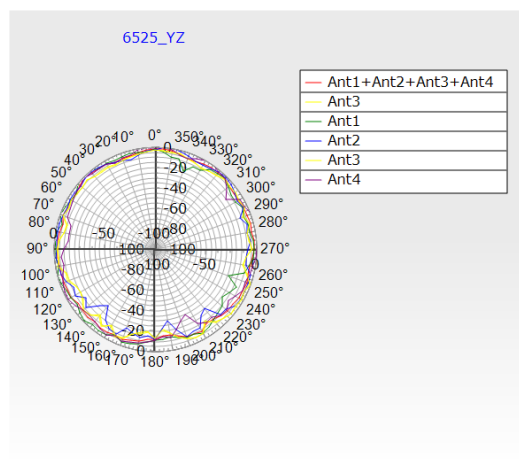
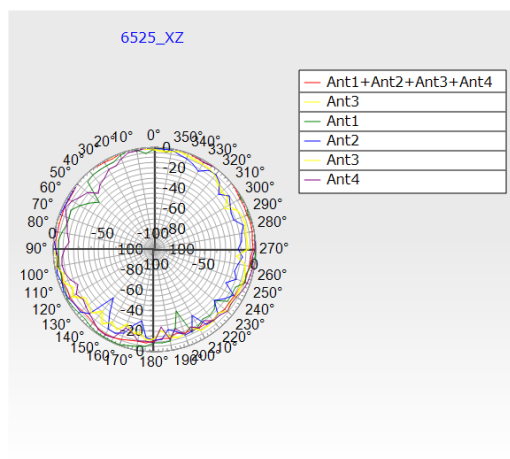
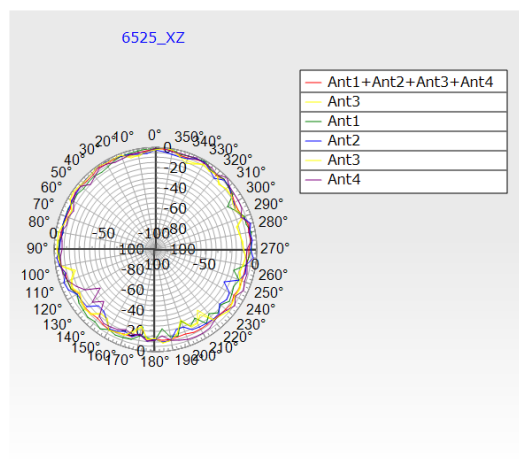
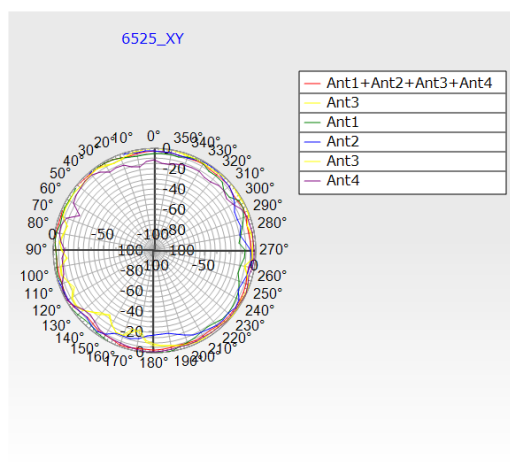
Ant ((#1 + #2 + #3 + #4)_Uncorr. DG:



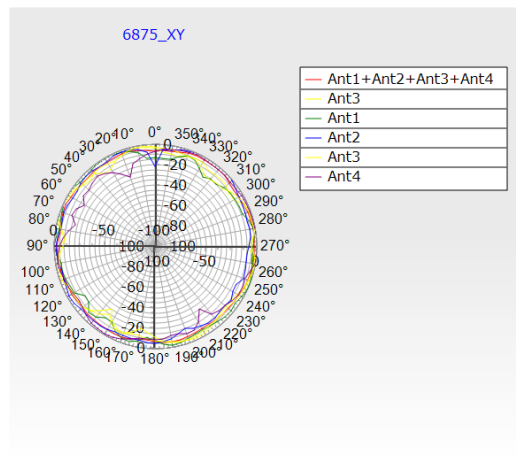
Phi_6525MHz



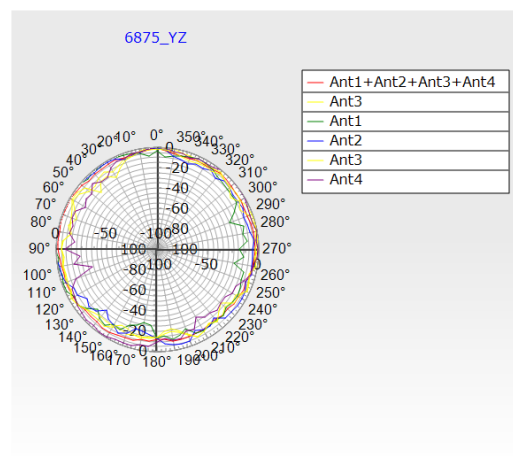
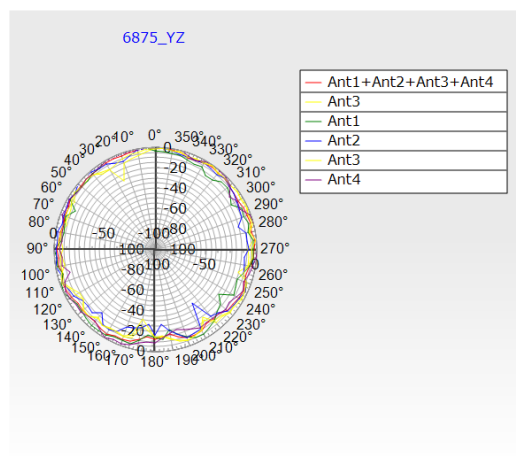
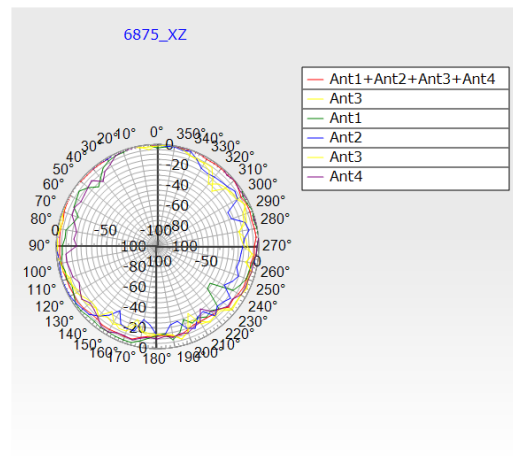
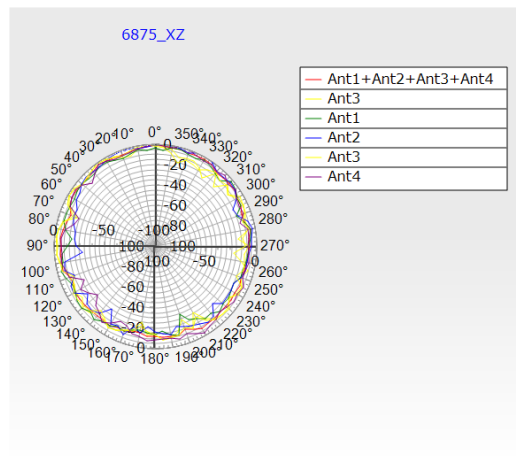
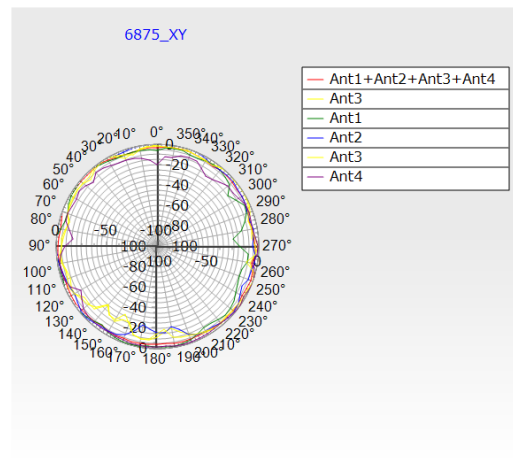
Theta_6525MHz



Phi_6875MHz

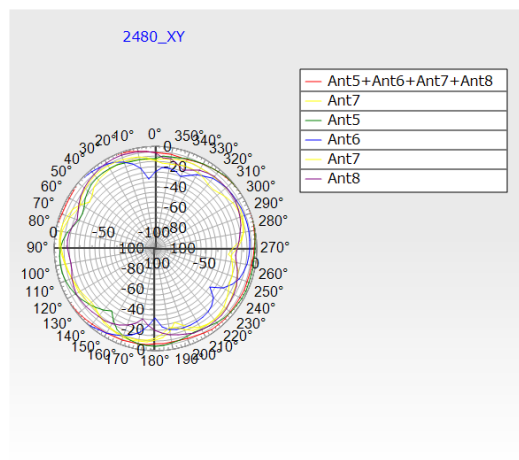


Theta_6875MHz

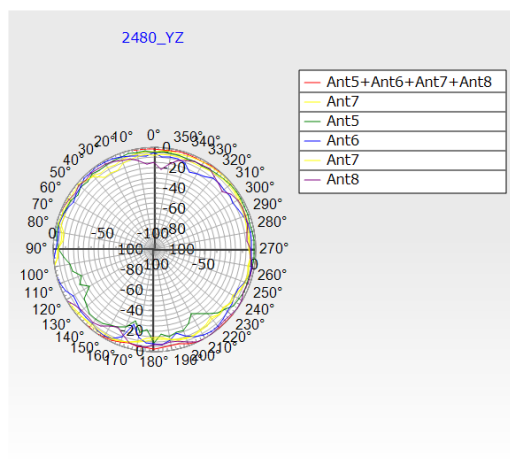
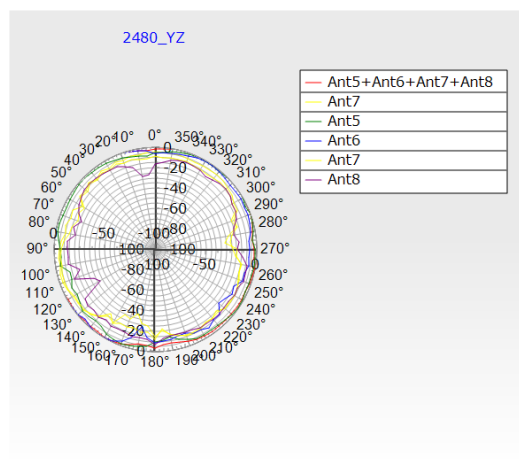
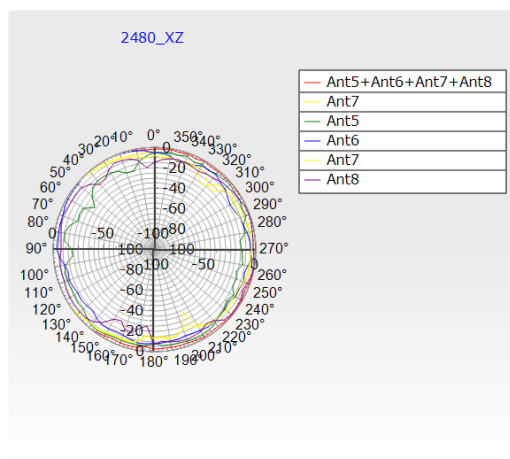
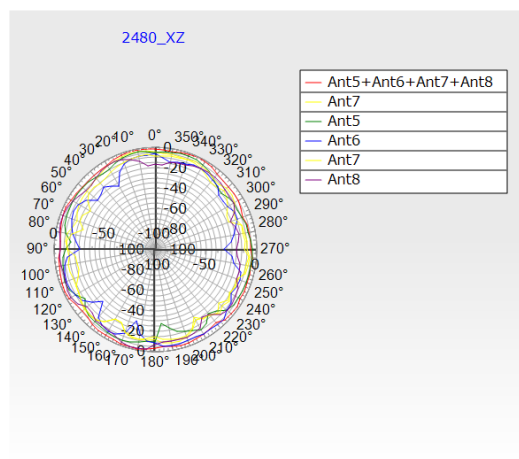
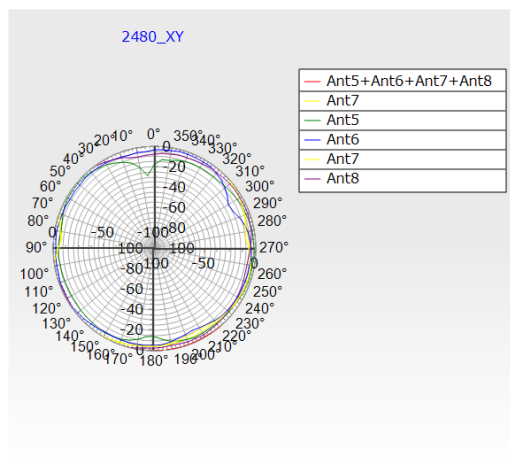


2.4GHz Ant #5, Ant #6, Ant #7, Ant #8 and Ant ((#5 + #6 + #7 + #8)_Corr. DG:

Phi_2480MHz

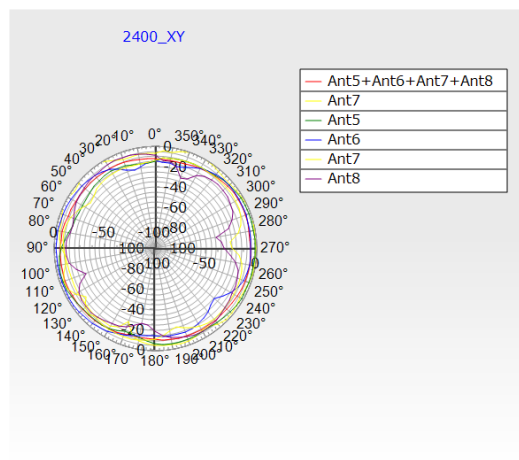


Theta_2480MHz

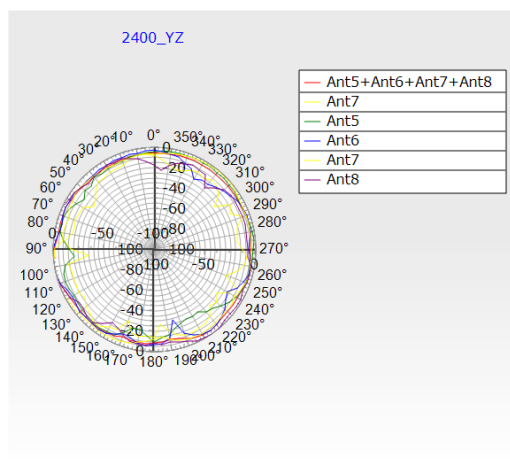
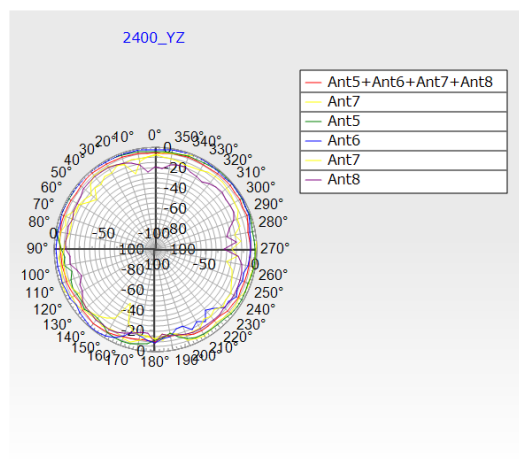
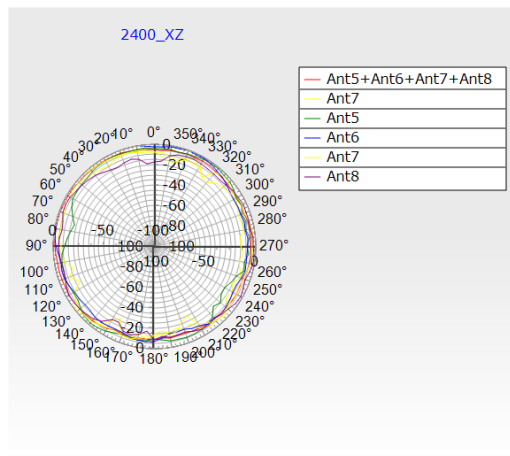
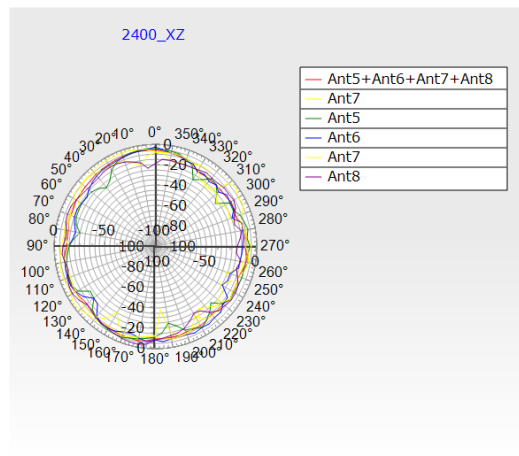
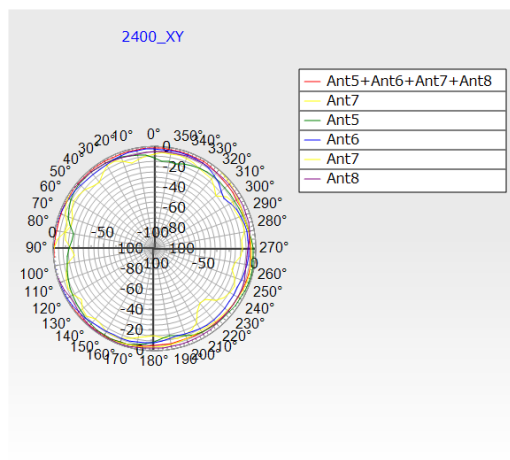


2.4GHz Ant #5, Ant #6, Ant #7, Ant #8 and Ant ((#5 + #6 + #7 + #8)_Uncorr. DG:

Phi_2400MHz

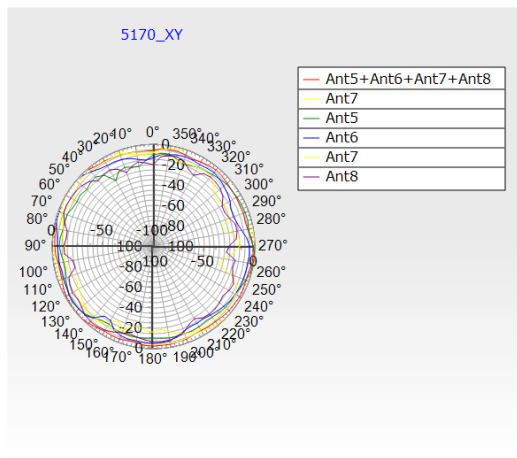


Theta_2400MHz

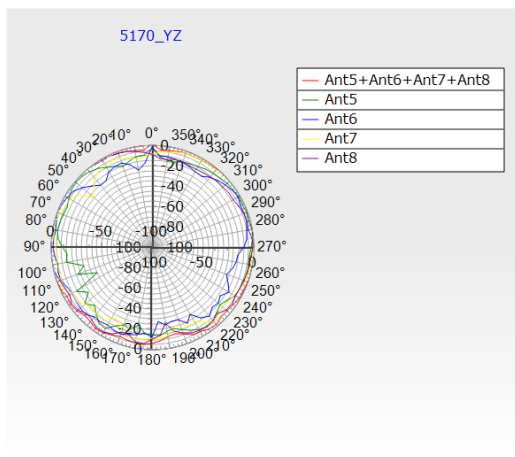
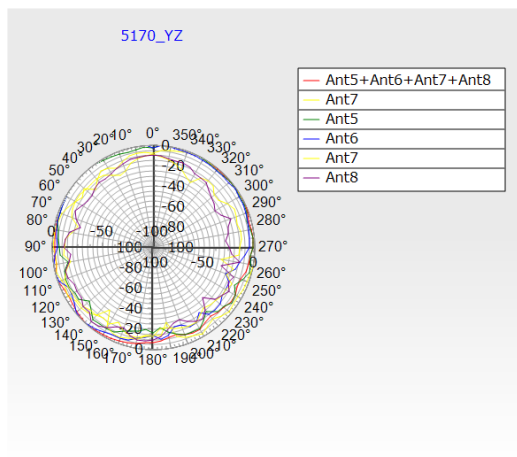
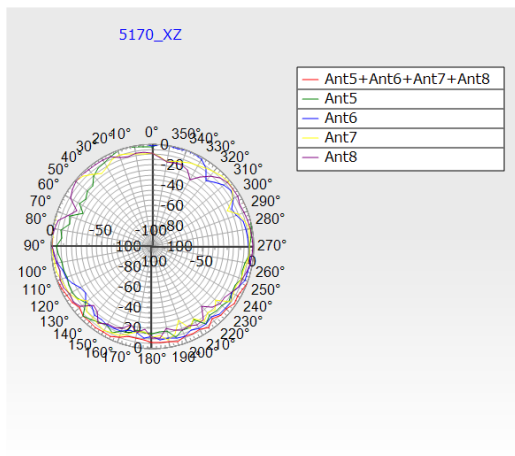
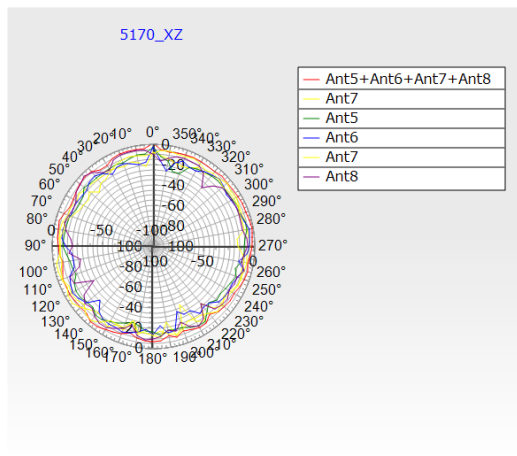
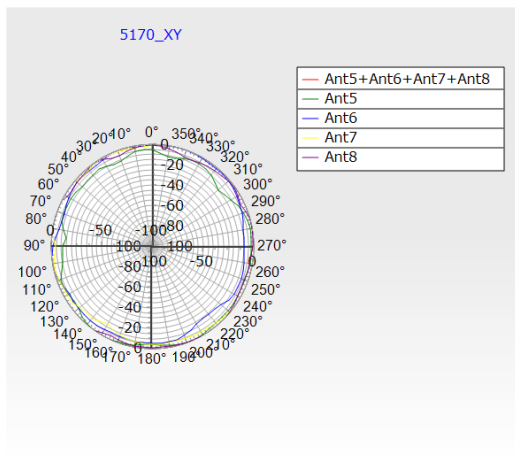


5GHz Ant #5, Ant #6, Ant #7, Ant #8 and Ant ((#5 + #6 + #7 + #8)_Corr. DG:

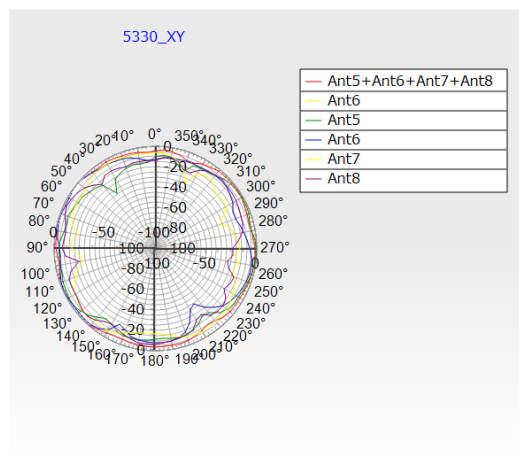
Phi_5170MHz



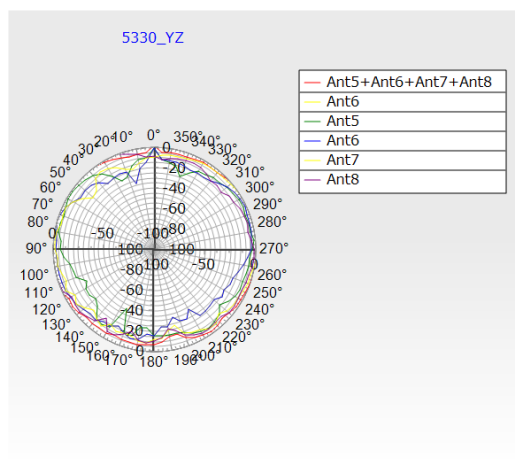
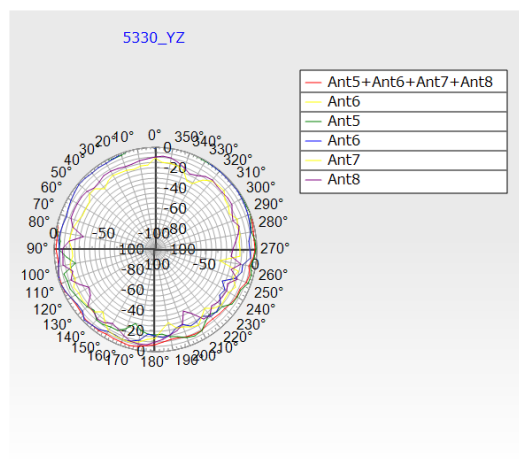
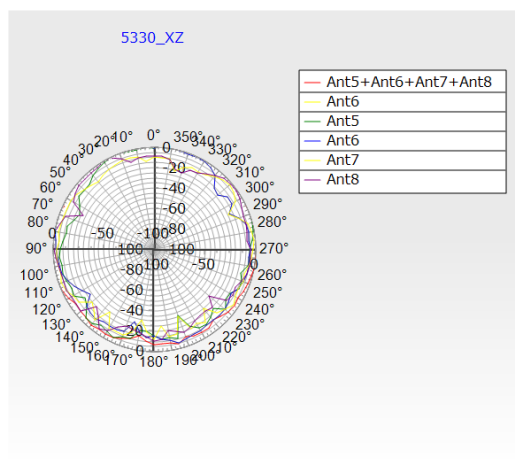
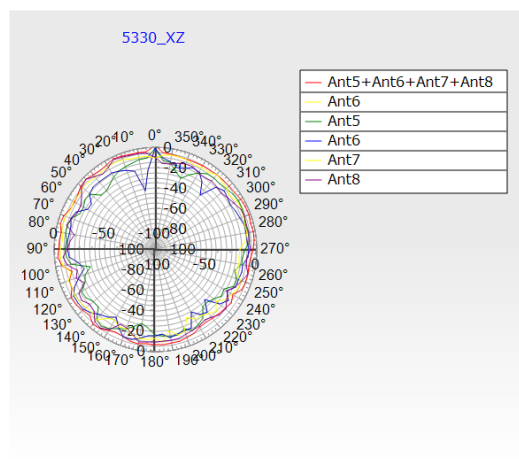
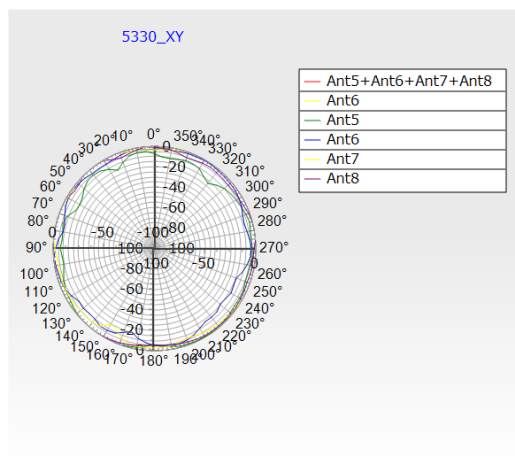
Theta_5170MHz



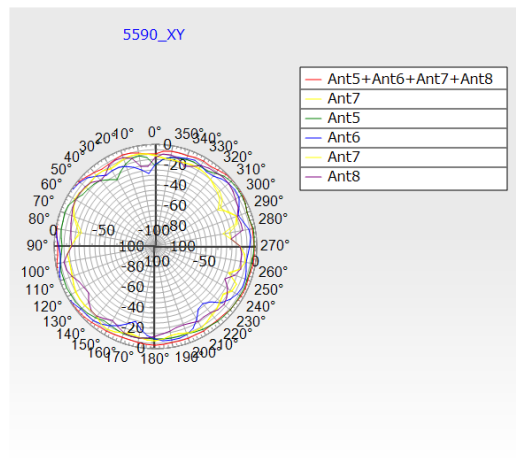
Phi_5330MHz



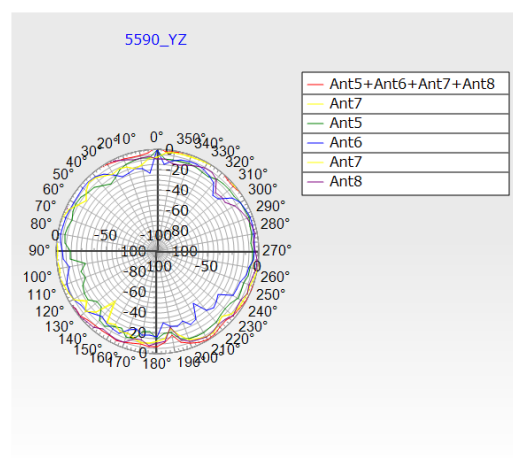
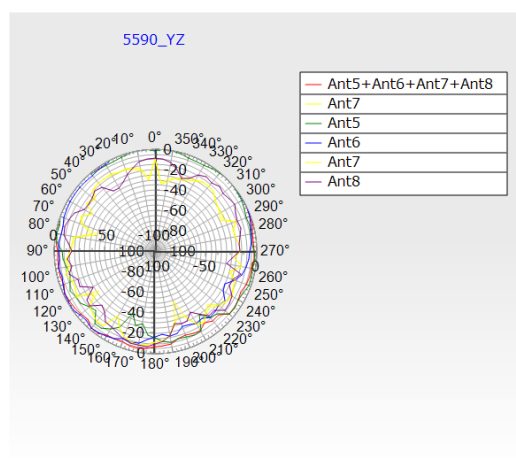
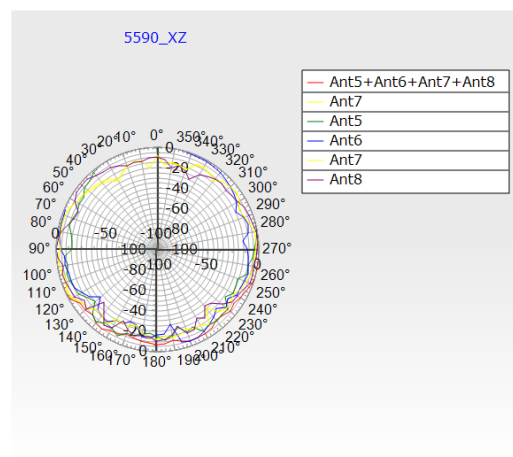
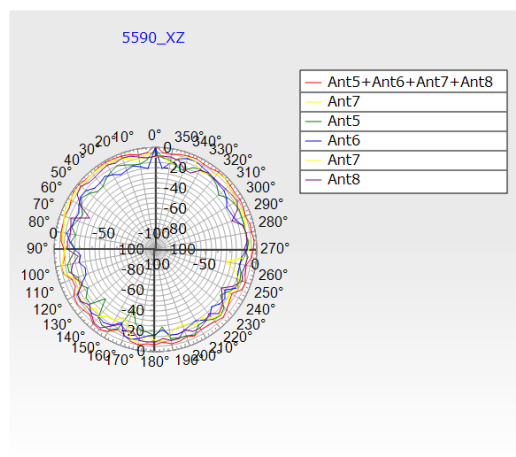
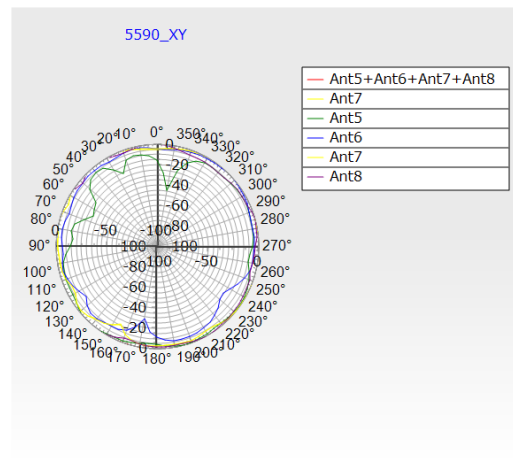
Theta_5330MHz



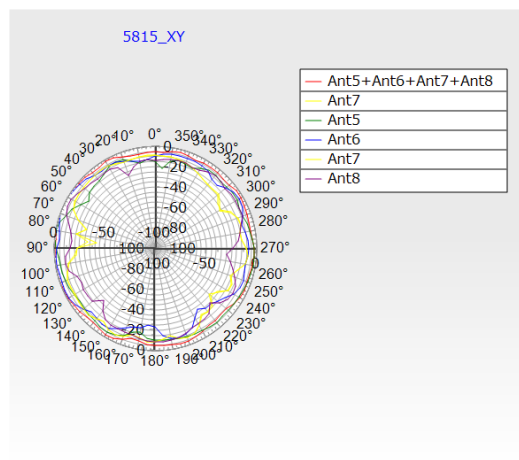
Phi_5590MHz



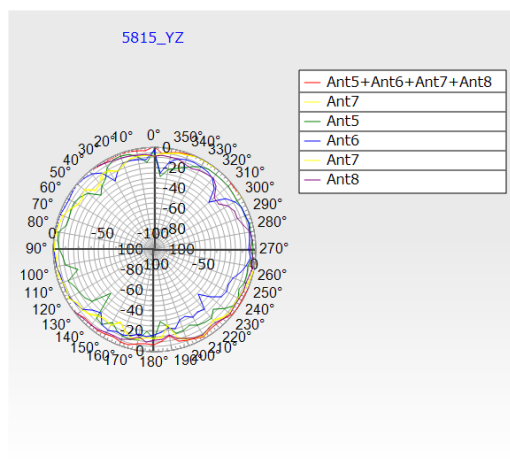
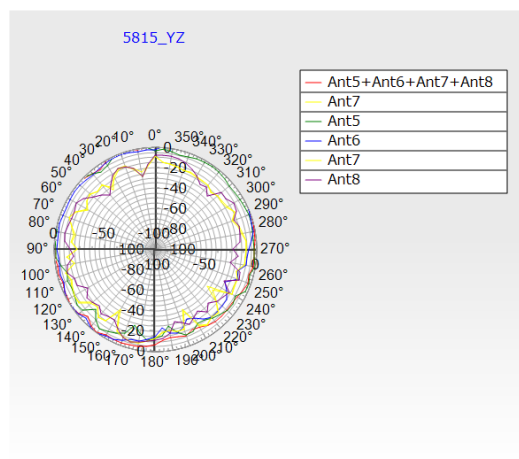
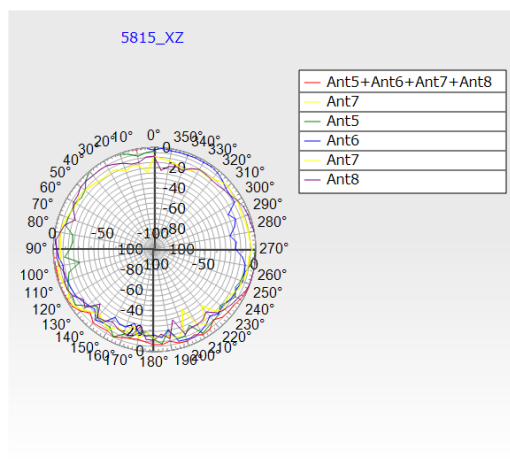
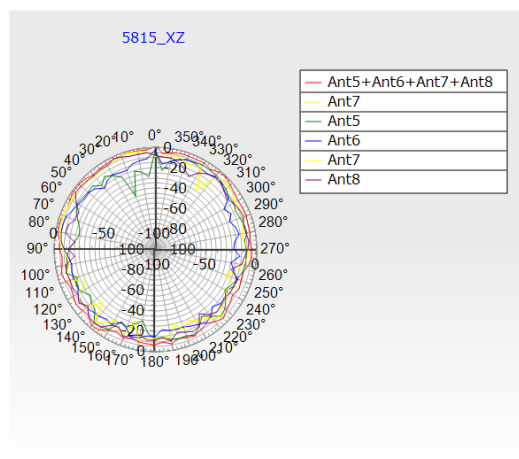
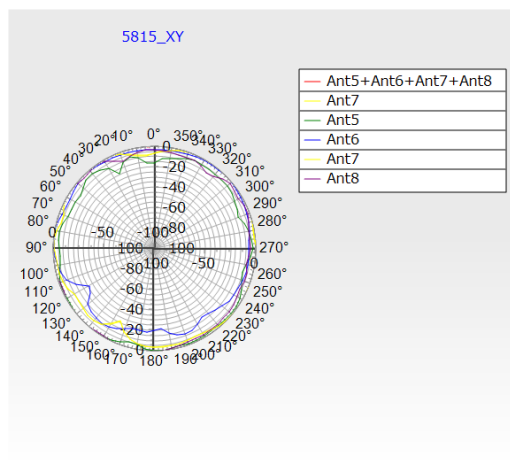
Theta_5590MHz



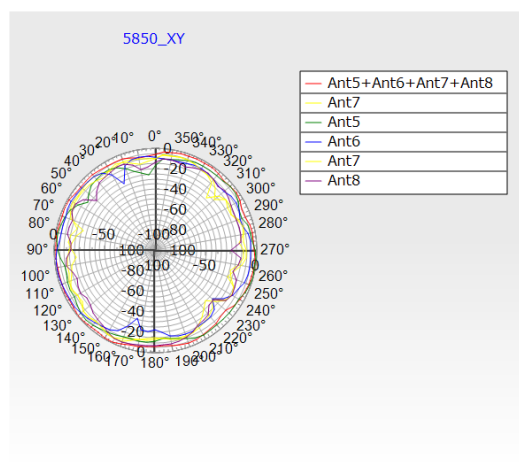
Phi_5815MHz



Theta_5815MHz



Phi_5850MHz



Theta_5850MHz

