



Antenna Composite Gain Test Report

Equipment	11ax Tri-band Extender
Brand Name	ARRIS
Model Name	X6
Applicant	ARRIS 3871 Lakefield Drive Suite 300 SUWANEE Georgia United States 30024
Manufacturer	Gemtek Technology No.15-1 Zhonghua Road, Hsinchu Industrial Park, Hukou, Hsinchu, Taiwan, R.O.C
Sample Received	Aug. 29, 2022
Start Test Date	Sep. 08, 2022
Final Test Date	Sep. 08, 2022



Approved by: Jackson Tsai

SPORTON INTERNATIONAL INC. Hsinhua Laboratory

No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)



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History of this test report

Report No.	Version	Description	Issued Date
AP282903AA	01	Initial issue of report	Apr. 11, 2023



1. Operation Mode and Antenna Information

Antenna Position	RF Port	Brand Name	Model Name	Ant. Type	Connector	Modes of Operation
2G 5GAnt1	1	Gemtek	LPVN-GM-TX-P-005	PCB	I-Pex	2.4GHz+5GHz
2G 5GAnt2	2	Gemtek	LPVN-GM-TX-P-006	PCB	I-Pex	2.4GHz+5GHz
6G Ant1	1	Gemtek	LPVN-GM-TX-P-001	PCB	I-Pex	6GHz
6G Ant2	2	Gemtek	LPVN-GM-TX-P-002	PCB	I-Pex	6GHz
6G Ant3	3	Gemtek	LPVN-GM-TX-P-003	PCB	I-Pex	6GHz
6G Ant4	4	Gemtek	LPVN-GM-TX-P-004	PCB	I-Pex	6GHz

Note:

2.4GHz and 5GHz Operation Mode (2TX/2RX)

2G 5GAnt1~2G 5Gant2 could transmit/receive simultaneously.

6GHz Operation Mode (4TX/4RX)

6G Ant1~6G Ant4 could transmit/receive simultaneously.

2. Test Frequency

The listed frequency of each bands are selected to represent each frequency bands

Band [MHz]	Test Frequency [MHz]
2400-2483.5	2450
5150-5250	5200
5250-5350	5300
5470-5725	5600
5725-5850	5785
5925-6425	6175
6425-6525	6475
6525-6875	6695
6875-7125	6995

3. Testing Location

Test Lab. : Sporton International Inc. Hsinhua Laboratory				
<input checked="" type="checkbox"/> Wen 33rd.St.	ADD:	No.14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)		
	TEL:	886-3-318-0787	FAX:	886-3-318-0287
Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
Radiated	05CH03-HY	Rex Liao	23.5~24.5°C / 45~55%	08/Sep/2022

Note:

Testing Site Information

Brand Name: TDK

Dimension: 11m*6m*6m

Characteristic: Fully Anechoic Chamber

4. Test Facility and Configuration

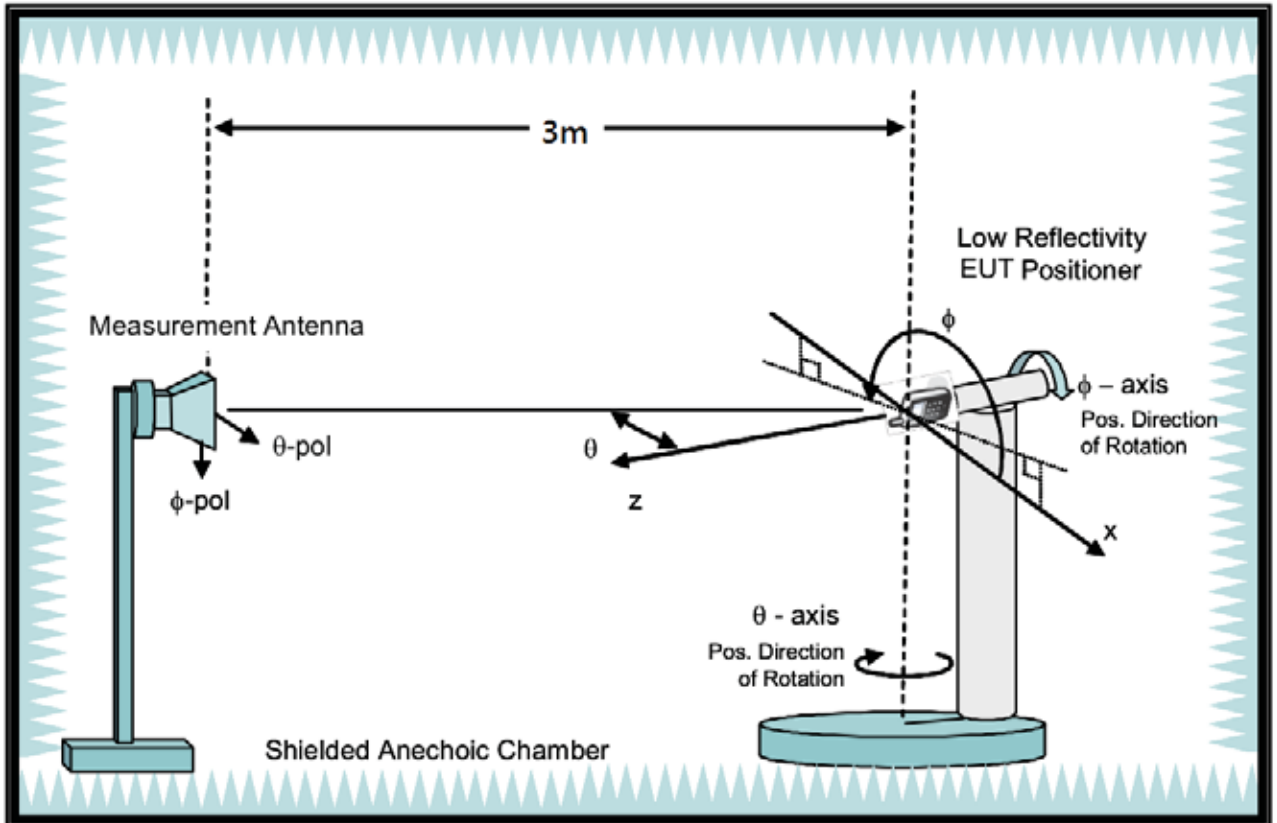
Test configuration: Reference to CITA OTA distributed-axes system configuration.

Chamber: Fully Anechoic Chamber.

Measurement antenna: Dual Polarization Horn antenna

Turntable: Multi-axis positioner (Theta and Phi angle).

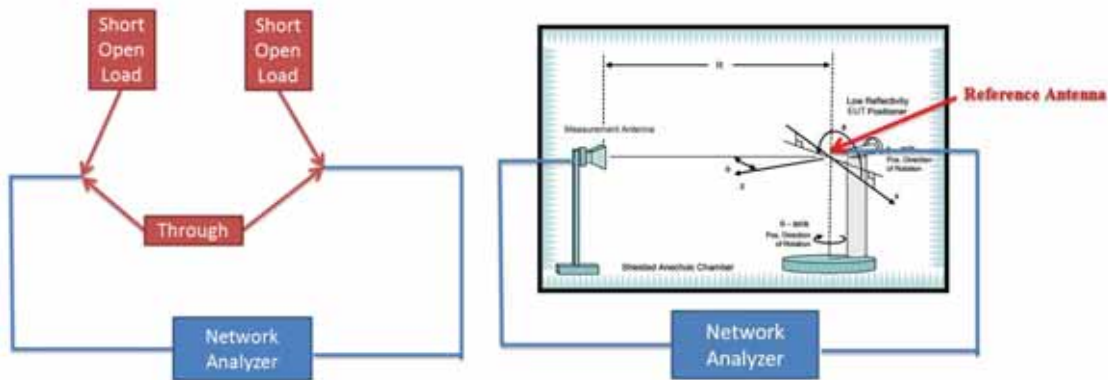
#Reference to CTIA “ctia-test-plan-for-wireless-device-over-the-air-performance-ver-3-7-1”



5. Reference Calibration

Connected cables to VNA calibration kit and use network analyzer internal function to do calibration. Do short, open and load to each side. Then connect through to both side and calibrate G values. The cable loss is calibrated and set inside the network analyzer.

Measurement Antenna is connected to port1 of Network analyzer and reference antenna connected to port 2 of Network Analyzer. Record G values and used with reference antenna gain to calculate gain factor.



Frequency (MHz)	2400	2450	2500	5150	5200	5300	5600	5750	5800	5900	6000	6500	7000	7200
G(theta) reading (dB)	-33.55	-33.27	-32.92	-32.91	-32.73	-32.02	-32.67	-32.82	-32.98	-33.18	-32.8	-33.92	-34.62	-35.57
G(phi) reading (dB)	-33.15	-32.7	-32.41	-32.61	-32.43	-31.72	-32.37	-32.51	-32.52	-32.66	-32.5	-33.62	-34.32	-35.48
Reference gain (dBi)	10.1	10.4	10.7	12.5	12.7	13.5	13.4	13.3	13.3	13.2	13.4	12.5	12.1	11.4
Factor(theta) (dB)	43.65	43.67	43.62	45.41	45.43	45.52	46.07	46.12	46.28	46.38	46.2	46.42	46.72	46.97
Factor(phi) (dB)	43.25	43.1	43.11	45.11	45.13	45.22	45.77	45.81	45.82	45.86	45.9	46.12	46.42	46.88

Note:

$$G \text{ reading (dB)} = 20 \cdot \log(V2/V1) = 10 \cdot \log(P2/P1)$$

V2 is the voltage of VNA port2 is measured, V1 is the voltage of VNA port1 is the reference source.

P2 is the power of VNA port2 is measured, P1 is the power of VNA port1 is the reference source.

$$\text{Factor} = \text{gain factor} + \text{power gain conversion} = (\text{Reference antenna gain}) - (G \text{ reading})$$



6. Test Method

EUT set on multi-axis positioner and adjust EUT's physical center to measurement reference center. Measurement antenna set at phi polarization and 1.5 meter height. Port 1 of Network analyzer connect to antenna 1 of EUT. Record G value every 7.5 degree from 0 to 352.5 degree on Phi angle and 0 to 180 on theta angle of multi-axis positioner. Then set measurement antenna to theta polarization and repeat process. Repeat process to each antenna of EUT.

DG steps:

1. Each Phi and Theta polarization antenna gain are measured for all test angles.
2. Composite Phi and Theta antenna gain are computed, using formula in KDB662911 D01 d) (i) and e) (ii), for all angles.
3. Composite antenna gain are examined for all angles to determine max gain and Phi/Theta position. Max gain and phi/theta position are listed in section 7 tables.

Note: Antenna gain = G reading + factor, The factor of chapter five includes reference antenna gain factor and power gain conversion.



7. Measured Values and Calculation of Maximum Gain Positions

DG_1SS max value position

Frequency (Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 (dBi)	-2.36	1.43	1.18	2.74	-2.05
Ant. 2 (dBi)	4.09	-2.61	-1.92	-3.81	3.61
DG [1SS] (dBi)	4.46	2.65	2.78	3.08	4.24
Polarization	Phi	Theta	Theta	Theta	Theta
Θ(°)	67.5	75	75	75	52.5
Φ(°)	300	345	345	345	195

Note: The DG 1SS max value position is the maximum value of section 11 table DG 1SS Result.

DG_1SS max value position calculation

Frequency (Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 [10 ^{^(G/20)}]	10 ^{^(-2.36/20)}	10 ^{^(1.43/20)}	10 ^{^(1.18/20)}	10 ^{^(2.74/20)}	10 ^{^(-2.05/20)}
Ant. 2 [10 ^{^(G/20)}]	10 ^{^(4.09/20)}	10 ^{^(-2.61/20)}	10 ^{^(-1.92/20)}	10 ^{^(-3.81/20)}	10 ^{^(3.61/20)}
Ant. 1 [10 ^{^(G/20)}] value	0.762	1.179	1.146	1.371	0.79
Ant. 2 [10 ^{^(G/20)}] value	1.601	0.74	0.802	0.645	1.515
Sum All Antenna [Amax]	2.363	1.919	1.947	2.016	2.305
DG [10*log(Amax ² /Nant)]	4.46	2.65	2.78	3.08	4.24

Note:

Directional Gain (1SS) is the max value of every look angle. Each position value is calculated by KDB662911 D01 d) (i).

$$\text{Directional gain (1SS)} = 10 \cdot \log(10^{(G_{ant1}/20)} + 10^{(G_{ant2}/20)} + 10^{(G_{ant3}/20)} + 10^{(G_{ant4}/20)} + \dots)^2 / N_{ant}$$



DG_1SS max value position

Frequency (Hz)	6.175G	6.475G	6.695G	6.995G
Ant. 1 (dBi)	-5.41	1.73	-5.7	-2.27
Ant. 2 (dBi)	-0.14	-4.08	1.57	-2.8
Ant. 3 (dBi)	-1.76	-2.79	-4.09	0.07
Ant. 4 (dBi)	1.25	-4.96	1.8	-0.71
DG [1SS] (dBi)	4.84	3.91	5.04	4.67
Polarization	Theta	Phi	Theta	Phi
Θ(°)	52.5	75	52.5	67.5
Φ(°)	0	82.5	322.5	30

DG_1SS max value position calculation

Frequency (Hz)	6.175G	6.475G	6.695G	6.995G
Ant. 1 [10^(G/20)]	10^(-5.41/20)	10^(1.73/20)	10^(-5.7/20)	10^(-2.27/20)
Ant. 2 [10^(G/20)]	10^(-0.14/20)	10^(-4.08/20)	10^(1.57/20)	10^(-2.8/20)
Ant. 3 [10^(G/20)]	10^(-1.76/20)	10^(-2.79/20)	10^(-4.09/20)	10^(0.07/20)
Ant. 4 [10^(G/20)]	10^(1.25/20)	10^(-4.96/20)	10^(1.8/20)	10^(-0.71/20)
Ant. 1 [10^(G/20)] value	0.536	1.22	0.519	0.77
Ant. 2 [10^(G/20)] value	0.984	0.625	1.198	0.724
Ant. 3 [10^(G/20)] value	0.817	0.725	0.624	1.008
Ant. 4 [10^(G/20)] value	1.155	0.565	1.23	0.922
Sum All Antenna [Amax]	3.492	3.136	3.572	3.424
DG [10*log(Amax^2/Nant)]	4.84	3.91	5.04	4.67

Note:

Directional Gain (1SS) is the max value of every look angle. Each position value is calculated by KDB662911 D01 d) (i).

$$\text{Directional gain (1SS)} = 10 \cdot \log(10^{(G_{ant1}/20)} + 10^{(G_{ant2}/20)} + 10^{(G_{ant3}/20)} + 10^{(G_{ant4}/20)} + \dots)^{2/N_{ant}}$$



8. Summary of Test Result

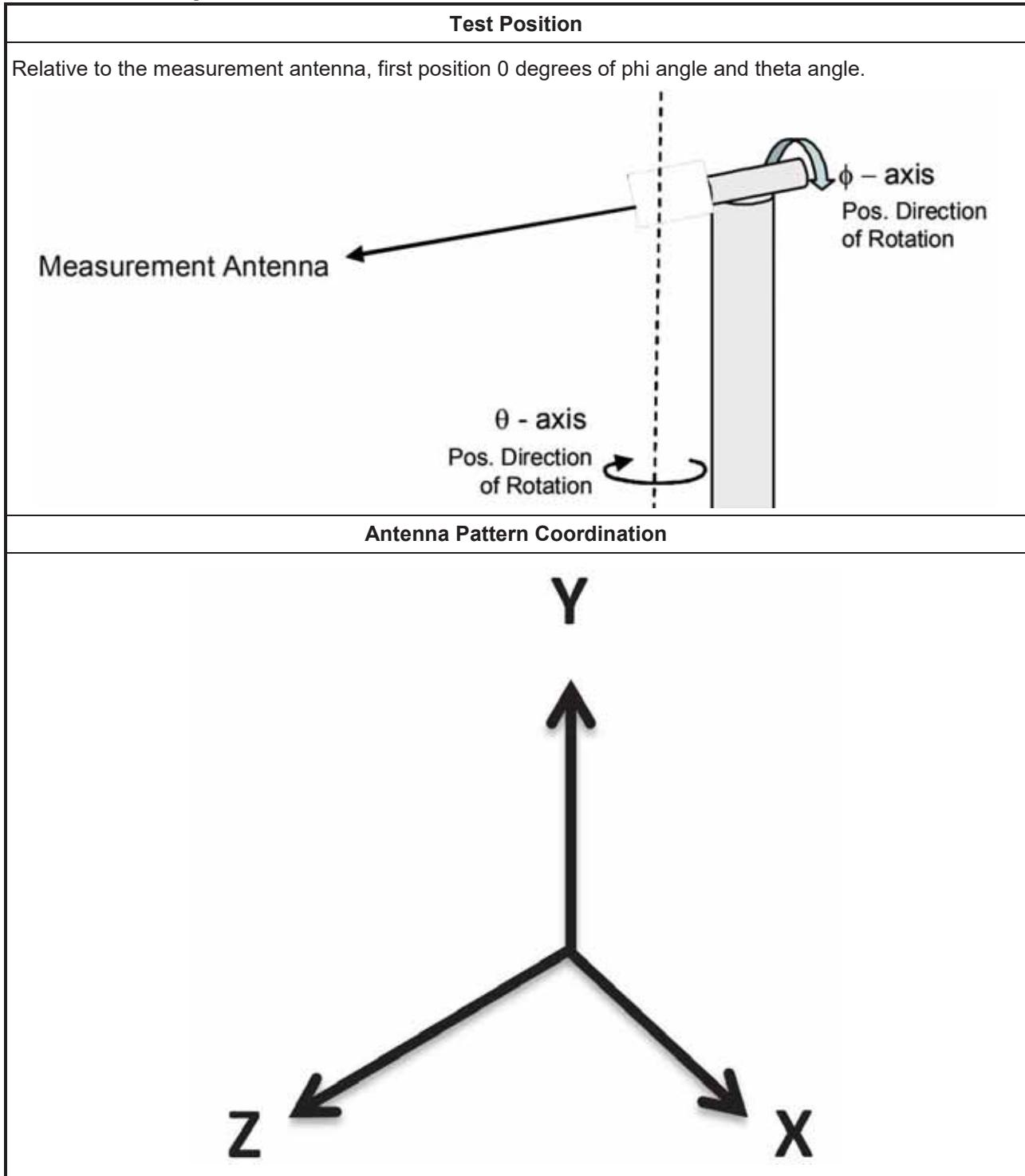
Frequency (Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	3.78	2.01	1.76	2.74	2.04
Ant. 2 Max Gain (dBi)	4.11	2.22	2.21	2.44	3.62
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Phi/97.5/45	Theta/112.5/142.5	Theta/112.5/150	Theta/75/345	Theta/22.5/15
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Phi/67.5/232.5	Theta/37.5/202.5	Theta/37.5/210	Theta/52.5/202.5	Theta/60/195
Max Gain (dBi)	4.11	2.22	2.21	2.74	3.62
DG [1SS] (dBi)	4.46	2.65	2.78	3.08	4.24
DG [2SS] (dBi)	4.11	2.22	2.21	2.74	3.62

Frequency (Hz)	6.175G	6.475G	6.695G	6.995G
Ant. 1 Max Gain (dBi)	2.62	2.46	2.28	3.06
Ant. 2 Max Gain (dBi)	2.13	2.19	3.4	2.53
Ant. 3 Max Gain (dBi)	2.96	2.22	2.03	3.37
Ant. 4 Max Gain (dBi)	3.02	2.13	2.41	2.78
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/75/187.5	Phi/90/187.5	Phi/75/82.5	Phi/60/97.5
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/37.5/345	Theta/75/337.5	Theta/75/330	Theta/75/315
Ant. 3 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/82.5/150	Phi/67.5/30	Theta/82.5/247.5	Theta/82.5/165
Ant. 4 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Phi/75/37.5	Phi/45/277.5	Phi/45/285	Phi/45/292.5
Max Gain (dBi)	3.02	2.46	3.4	3.37
DG [1SS] (dBi)	4.84	3.91	5.04	4.67
DG [2SS] (dBi)	3.02	2.46	3.4	3.37
DG [4SS] (dBi)	3.02	2.46	3.4	3.37

Note:

1. Antenna max gain is the max value of each individual antenna through all measurement angles.
2. The max gain is the max value of all antennas.
3. Directional Gain (2SS) = Directional Gain (1SS) – 3dB. If directional gain is less than max gain, use max gain as directional gain.
4. Directional Gain (4SS) = Directional Gain (1SS) – 6dB. If directional gain is less than max gain, use max gain as directional gain.

9. Test Setup



Note:

Photos of Test Position: Please refer to the test photos in the appendix.



10. Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
Horn Antenna	SCHWARZBECK	BBHA9120D	BBHA 9120D-1543	1GHz~18GHz	May 31, 2022	May 30, 2023
Dual Polarization Horn Antenna	Sporton	S0209DP	S0209DP-001	2GHz~9GHz	N.C.R.	N.C.R.
ENA Series Network Analyzer	AGILENT	E5071C	MY46419201	100kHz~8.5GHz	Feb. 21, 2022	Feb. 20, 2023
VNA Calibration Kit	TS RF	TS85033E-F	-	DC~9GHz	N.C.R.	N.C.R.
Multi-axis positioner	Sporton	MAPS01	MAPS01-001	Theta / Phi axis	N.C.R.	N.C.R.
Test Software	SPORTON	SENSE-RDG	V1.0.8	-	N.C.R.	N.C.R.

Note: Calibration Interval of instruments listed above is one year. NCR means Non-Calibration required.



11. Test Results

Please refer to the appendix.

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————THE END————



Radiated Composite Gain Data of 2.4GHz&5GHz

Appendix A

Freq(Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	3.78	2.01	1.76	2.74	2.04
Ant. 2 Max Gain (dBi)	4.11	2.22	2.21	2.44	3.62
Ant. 1 Polarization/ $\theta(^{\circ})/\Phi(^{\circ})$	Phi/97.5/45	Theta/112.5/142.5	Theta/112.5/150	Theta/75/345	Theta/22.5/15
Ant. 2 Polarization/ $\theta(^{\circ})/\Phi(^{\circ})$	Phi/67.5/232.5	Theta/37.5/202.5	Theta/37.5/210	Theta/52.5/202.5	Theta/60/195
Max Gain (dBi)	4.11	2.22	2.21	2.74	3.62
DG [1SS] (dBi)	4.46	2.65	2.78	3.08	4.24
DG [2SS] (dBi)	4.11	2.22	2.21	2.74	3.62



Radiated Composite Gain Data of 2.4GHz&5GHz

Appendix A

(D22.5)	10.9610.58	8.1961.13	-4.340.3	2.729.26	1.451.34	-1.320.38	2.092.25	-2.632.27	2.630.02	3.410.96	-4.650.73	-7.397.67	-8.207.3	6.959.65	6.070.15	-4.483.33	2.789.213	-1.640.15	6.910.72	0.710.26	-2.120.99	-4.498.07	4.510.28	-13.041.78
(D21)	10.0610.41	-6.999.16	-7.896.1	3.280.27	1.280.61	0.320.03	-1.091.38	1.621.161	2.009.29	4.240.36	6.289.19	-6.099.12	8.3170.6	8.443.19	2.598.21	-2.909.74	3.514.354	-3.020.1	0.780.01	-0.070.85	0.344.25	5.533.67	6.948.28	-7.799.65
(D17.5)	6.770.65	6.448.63	6.936.17	4.540.23	0.016.16	0.702.02	0.411.05	-1.919.24	2.670.75	6.859.66	-10.820.46	-14.571.354	-10.969.93	7.154.478	-3.310.38	2.240.29	1.220.449	-2.290.46	-1.080.93	-1.192.29	2.990.38	5.516.67	-7.440.75	
(D16)	6.214.93	5.314.47	-4.011.351	3.071.86	0.810.03	0.210.62	-1.371.88	2.029.29	2.934.29	6.630.101	-10.120.13	-10.200.10	-11.820.28	7.260.48	-3.082.17	-1.491.74	-1.840.13	1.880.18	1.550.13	-1.131.74	-2.420.96	-2.570.28	4.860.65	-7.341.21
(D15.5)	6.620.45	-3.347.27	-1.561.48	2.161.87	0.702.26	0.431.06	-1.140.12	-1.681.87	2.741.31	7.544.90	-8.890.16	8.510.66	7.640.22	-8.850.63	5.551.01	6.140.18	2.860.26	3.030.33	-4.420.22	-1.560.25	-1.660.28	3.610.45	4.910.62	6.050.94
(D15)	6.480.58	-4.44	2.481.29	0.890.08	-1.641.82	-1.950.25	2.310.65	-1.202.18	4.430.74	-11.410.29	-11.420.29	-10.831.08	-10.347.22	-8.470.48	-4.284.14	-3.360.39	-4.071.57	3.140.03	2.910.09	2.930.16	3.201.3	3.616.15	7.390.10	-14.619.65
(D14.5)	-14.980.12	-6.040.04	-2.119	-1.150.11	-1.590.91	-0.710.69	-1.231.24	-1.360.251	5.314.39	-10.580.74	-10.580.74	-7.630.16	8.410.34	-4.980.44	-2.960.22	2.780.25	4.780.25	-3.980.17	-3.380.54	-1.140.28	3.740.35	-6.220.76	-12.190.16	-15.960.63
(D14)	-10.120.03	9.830.74	4.740.39	-2.291.82	-1.641.16	0.951.18	-2.280.25	3.170.82	-8.330.125	-10.387.42	-8.030.47	-4.830.67	7.130.52	4.870.23	-3.910.34	2.840.24	2.840.24	-1.211.4	2.110.67	-3.18	2.480.54	-4.990.70	-10.940.16	
(D13.5)	-13.1410.38	8.980.65	5.510.49	2.760.24	2.210.24	3.610.34	3.840.18	4.950.58	4.848.149	-10.080.55	5.810.24	7.201.71	8.710.78	-5.090.57	4.190.37	4.820.63	2.190.51	8.116.16	-1.120.84	2.260.27	2.410.46	-2.110.74	14.870.22	6.580.29
(D13)	-10.940.88	-7.863	8.710.48	-3.80.38	4.410.18	4.231.15	4.270.46	5.360.674	-15.770.12	8.850.47	8.230.81	-7.570.67	-10.970.48	4.990.78	4.240.11	-3.890.26	-2.720.26	1.010.05	-1.490.28	-1.440.37	-2.880.26	1.980.25	5.140.49	-12.690.91
(D12.5)	11.220.903	7.017.39	5.077.71	8.890.63	5.760.56	6.310.43	3.184.23	3.184.23	-15.080.11	5.160.80	5.170.54	4.909.78	10.780.16	4.450.17	7.550.59	4.914.21	2.760.99	0.940.95	2.230.66	3.290.22	3.350.58	8.320.75	15.110.97	
(D12)	7.517.31	6.940.64	-1.071.02	1.110.93	8.30.87	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21	8.110.21
(D11.5)	7.190.48	8.187.11	6.150.06	-10.980.43	8.471.75	7.417	4.200.241	5.177.73	8.170.23	-10.890.63	4.120.78	4.880.1407	10.430.307	11.340.142	-17.760.89	7.120.451	6.410.534	3.990.33	2.070.03	4.850.45	4.840.32	8.620.58	4.720.784	4.110.68
(D11)	4.650.722	-10.500.13	-12.890.16	-10.840.44	8.677.03	7.410.13	5.050.44	5.290.65	-7.930.95	-5.974.44	-5.240.76	6.180.81	8.94.34	8.550.197	-1.580.80	6.070.63	4.720.35	-2.780.13	-3.220.35	4.420.45	4.100.109	-10.070.32	5.871.0	-7.715.95
(D10.5)	4.260.521	-5.590.42	-9.950.121	-10.130.42	9.430.58	3.970.45	4.995.64	6.480.1237	-11.230.54	-5.990.55	-4.830.24	5.267.16	5.267.16	5.267.16	5.267.16	5.267.16	5.267.16	5.267.16	5.267.16	5.267.16	5.267.16	5.267.16	5.267.16	5.267.16
(D10)	5.550.783	4.800.81	-12.980.131	-13.840.132	11.717.89	5.20.2	8.690.132	13.410.129	8.200.44	-4.600.44	-4.760.24	5.20.2	4.1	6.850.55	-4.171.1004	-12.090.27	-7.690.27	-4.071.38	4.940.48	-3.980.35	-3.980.35	5.940.74	-7.670.63	-6.900.64
(D9.5)	4.200.171	6.970.105	8.690.111	-12.540.1201	-5.920.3	-3.430.93	-5.970.91	-7.970.68	-4.400.92	-8.160.35	-2.920.42	-7.602.97	-6.140.58	4.540.94	-8.170.1004	8.870.23	2.740.35	6.948.12	-2.810.27	2.740.35	6.948.12	-2.810.27	2.740.35	6.948.12
(D9)	7.080.673	7.040.62	-11.770.1202	-11.260.78	3.750.21	-1.790.165	-2.293.34	-5.940.58	-6.930.41	-2.793.27	-3.704.84	-4.290.47	-5.640.71	6.090.94	6.090.94	6.090.94	6.090.94	6.090.94	6.090.94	6.090.94	6.090.94	6.090.94	6.090.94	6.090.94
(D8.5)	7.914.63	-7.650.82	-10.300.171	-11.090.5	5.580.35	-3.380.33	-3.814.28	4.740.51	6.430.90	-12.040.98	6.690.63	7.310.4	-11.290.91	6.930.05	-12.820.147	-10.750.174	-15.190.123	-10.790.18	4.720.43	-6.750.91	-7.690.21	-11.030.114	6.610.63	8.430.63
(D8)	-10.810.56	-10.140.13	-13.010.55	-8.340.68	-1.640.28	-2.920.29	-3.544.46	-5.410.55	-5.810.59	-7.030.130	-13.102.47	-11.210.104	9.740.49	8.690.49	8.690.49	8.690.49	8.690.49	8.690.49	8.690.49	8.690.49	8.690.49	8.690.49	8.690.49	8.690.49
(D7.5)	-11.430.116	-12.040.117	-12.040.116	-11.950.113	-10.930.103	-8.780.97	-6.736.72	1.020.83	1.600.93	-10.930.103	-10.930.103	-10.930.103	9.210.82	8.110.81	8.110.81	8.110.81	8.110.81	8.110.81	8.110.81	8.110.81	8.110.81	8.110.81	8.110.81	8.110.81
(D7)	-10.380.135	-14.470.161	-15.110.126	-14.610.126	8.860.84	-7.140.48	-6.907.18	-7.778.19	6.070.72	6.070.72	6.070.72	6.070.72	6.070.72	6.070.72	6.070.72	6.070.72	6.070.72	6.070.72	6.070.72	6.070.72	6.070.72	6.070.72	6.070.72	



Radiated Composite Gain Data of 2.4GHz&5GHz

Appendix A

θ (°)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360
0(0°)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000



Radiated Composite Gain Data of 2.4GHz&5GHz

Appendix A

Gain Result

Freq(Hz)	2.45GHz	Theta1 = 0°		Theta1 = 15°		Theta1 = 30°		Theta1 = 45°		Theta1 = 60°		Theta1 = 75°		Theta1 = 90°		Theta1 = 105°		Theta1 = 120°		Theta1 = 135°		Theta1 = 150°		Theta1 = 165°		Theta1 = 180°											
Gain	(dBS)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(°)									
(H1)	1.71	-1.72	-4.14	-7.30	-10.25	-12.96	-15.42	-17.62	-19.56	-21.24	-22.66	-23.83	-24.76	-25.45	-25.91	-26.15	-26.26	-26.26	-26.15	-25.91	-25.45	-24.76	-23.83	-22.66	-21.24	-19.56	-17.62	-15.42	-12.96	-10.25	-7.30	-4.14	-1.72	1.71			
(H2)	4.82	4.82	4.33	3.83	3.33	2.83	2.33	1.83	1.33	0.83	0.33	-0.17	-0.67	-1.17	-1.67	-2.17	-2.67	-3.17	-3.67	-4.17	-4.67	-5.17	-5.67	-6.17	-6.67	-7.17	-7.67	-8.17	-8.67	-9.17	-9.67	-10.17	-10.67	-11.17	-11.67	-12.17	
(H3)	1.39	1.39	1.40	1.41	1.42	1.43	1.44	1.45	1.46	1.47	1.48	1.49	1.50	1.51	1.52	1.53	1.54	1.55	1.56	1.57	1.58	1.59	1.60	1.61	1.62	1.63	1.64	1.65	1.66	1.67	1.68	1.69	1.70	1.71	1.72	1.73	1.74
(H4)	1.71	1.71	1.72	1.73	1.74	1.75	1.76	1.77	1.78	1.79	1.80	1.81	1.82	1.83	1.84	1.85	1.86	1.87	1.88	1.89	1.90	1.91	1.92	1.93	1.94	1.95	1.96	1.97	1.98	1.99	2.00	2.01	2.02	2.03	2.04	2.05	2.06

Sparton International, Inc.



Radiated Composite Gain Data of 2.4GHz&5GHz

Appendix A

(F)(25)	(1)0:00-10:35	2:50:84	4:97:58	4:79:38	3:61:35	3:58:34	4:77:12	5:38:47	4:43:48	4:50:43	4:77:22	4:18:49	1:19:78	4:14:12	4:73:23	4:88:71	6:33:57	4:71:41	3:33:35	3:4:58	5:31:02	1:09:84	1:11:23	14:11:22
(C)(25)	-18:53-13.67	-19:51:81	-7:88:68	-5:68:45	3:74:26	2:48:48	3:33:51	4:14:09	4:63:57	5:58:58	6:91:81	8:4:64	8:57:25	7:54:76	4:71:42	7:47:71	8:28:74	8:08:47	3:77:31	2:82:35	4:88:56	6:17:39	-10:16:12	-13:63:47
(L)(25)	-14:04:11	-10:18:65	-7:53:65	5:22:33	5:00:55	6:20:78	-1:42:33	4:29:52	4:00:80	4:10:86	-1:47:17	-1:88:01	-1:80:17	-1:41:11	-2:17:41	-1:46:06	-3:17:58	6:20:47	4:45:84	2:29:35	4:22:15	4:51:78	-1:86:01	-1:73:16
(R)(25)	16:06:13	-12:57:42	8:18:74	6:14:54	3:22:23	2:08:12	-2:78:36	4:04:71	5:09:69	4:01:15	11:11:25	-14:29:13	-12:80:15	-15:04:15	-12:81:10	8:57:72	6:57:13	6:68:66	5:12:49	3:94:16	2:58:29	2:30:41	3:91:11	9:24:17
(C)(25)	-16:33:16	-13:35:13	7:35:47	3:54:25	1:87:57	4:97:08	-1:41:84	3:31:02	4:2:78	8:78:17	-12:00:19	-11:21:29	-11:38:02	-12:08:14	-14:86:17	11:34:11	8:41:76	6:14:08	6:41:35	3:28:77	2:54:02	3:31:74	6:27:86	-15:53:17
(L)(25)	-11:67:11	-10:19:13	8:28:77	5:31:36	2:64:28	2:21:27	-1:71:48	4:84:25	4:84:18	-16:34:87	-15:88:13	-14:86:15	-13:71:47	4:55:21	9:76:13	11:14:12	14:04:10	7:06:55	6:84:62	6:58:29	4:02:52	2:64:81	6:16:10	-18:44:14
(R)(25)	-16:29:43	-17:35:12	8:64:71	5:23:82	2:86:12	-1:37:01	0:06:19	2:31:32	7:70:25	-17:63:46	-14:01:94	-15:59:17	-15:71:13	9:18:63	9:08:14	-11:43:43	-14:94:66	7:47:54	6:84:61	4:34:08	-1:57:55	-1:85:33	1:28:17	-15:59:19
(F)(25)	17:16:15	-13:52:46	-10:53:85	6:91:84	3:42:13	-1:50:12	-1:64:21	3:81:61	-1:13:89	-13:21:82	-7:84:97	4:00:24	-12:24:13	-12:36:13	-11:33:18	-10:36:14	-14:57:66	5:14:05	4:32:64	3:39:24	2:71:91	3:41:44	4:27:82	-18:29:18
(C)(25)	-17:09:45	-11:72:42	8:88:74	6:50:52	3:59:33	2:75:21	2:17:24	4:42:82	-11:86:78	-16:21:36	-12:59:14	-17:48:18	-17:44:12	-11:17:01	8:81:93	-14:22:15	-17:59:49	5:87:37	-4:48:07	5:44:21	-1:82:13	3:31:47	4:77:84	-18:31:88
(L)(25)	11:57:28	-11:55:19	8:71:13	6:65:59	4:79:48	3:30:29	3:01:36	4:96:10	16:91:44	-12:18:42	-10:99:65	-9:65:11	-14:91:84	-14:71:38	-11:57:21	-13:48:12	-15:59:75	4:08:9	4:84:86	6:55:44	2:56:28	3:58:58	6:74:77	-18:18:58
(R)(25)	-1:52:28	-1:18:13	-10:29:36	8:10:74	5:59:55	4:9:3	2:38:15	5:28:12	-1:78:11	4:85:97	-10:48:27	-17:48:17	17:66:17	4:90:27	16:53:12	-17:07:14	18:45:13	7:68:72	6:50:98	7:24:15	2:33:31	5:51:19	12:31:46	-18:11:87
(C)(25)	4:83:74	8:52:18	-12:02:17	-11:33:8	6:38:28	7:48:02	6:51:51	7:04:97	4:84:44	7:34:12	-10:16:51	-13:14:57	-18:22:17	-18:01:17	-16:14:88	-17:40:28	-15:34:13	-18:08:78	11:28:11	6:54:75	5:26:57	1:55:49	14:18:34	-12:41:78
(L)(25)	8:78:83	8:11:48	-10:73:10	-10:82:71	7:01:78	6:38:61	4:04:19	6:81:83	8:20:46	5:48:54	5:57:37	6:30:25	-15:64:14	-16:51:18	-16:59:13	-14:79:13	-18:03:18	-18:75:17	-17:81:16	-11:74:15	6:23:10	12:78:14	-11:08:18	-11:59:49
(R)(25)	-13:10:62	-12:17:14	-13:50:12	8:81:77	7:85:47	8:17:38	7:48:86	7:15:86	4:59:14	-1:25:56	7:84:19	-11:15:45	-18:45:18	-18:57:47	-16:32:16	6:22:19	-16:24:13	-16:11:44	-15:99:44	-15:22:19	-18:24:13	-16:17:17	-18:78:14	-17:12:45
(C)(25)	7:16:78	-7:36:47	-11:22:15	-17:85:12	8:84:44	5:47:52	5:76:78	8:84:12	8:87:88	-7:37:28	-4:97:24	7:10:14	-13:14:17	-18:86:17	-18:42:19	-14:44:16	-19:08:16	-18:26:15	-12:52:12	-12:36:14	-13:02:13	-18:52:16	-14:82:15	-13:73:25
(L)(25)	-13:15:13	-12:15:14	-18:36:17	-17:84:13	-16:11:01	-13:86:07	-12:17:13	9:24:18	-12:94:18	-12:94:18	-12:94:18	-12:94:18	-12:94:18	-12:94:18	-12:94:18	-12:94:18	-12:94:18	-12:94:18	-12:94:18	-12:94:18	-12:94:18	-12:94:18	-12:94:18	-12:94:18
(R)(25)	-10:03:14	-10:07:10	-12:27:14	-12:27:14	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10	-10:07:10
(C)(25)	9:26:92	-0:06:02	-12:12:17	-11:09:64	7:31:63	4:52:33	2:47:37	5:24:15	4:24:32	5:24:15	4:24:32	5:24:15	4:24:32	5:24:15	4:24:32	5:24:15	4:24:32	5:24:15	4:24:32	5:24:15	4:24:32	5:24:15	4:24:32	5:24:15
(L)(25)	-10:36:16	-12:17:15	-18:41:15	-11:44:59	5:81:34	2:80:36	-1:95:27	3:04:43	5:5:81	6:86:10	-10:24:69	-10:84:10	-18:64:15	-15:26:15	-10:02:19	-18:25:14	-17:83:16	-18:27:13	-18:73:16	-18:61:15	-18:14:18	-19:05:17	-13:17:15	-10:76:10
(R)(25)	-11:45:13	-13:14:56	-15:59:18	-8:84:66	4:75:39	3:41:29	3:34	4:5:36	1:61:27	-17:32:15	-16:13:55	-14:14:12	-15:18:17	-16:01:17	-13:46:14	-15:15:16	-15:15:16	-15:15:16	-15:15:16	-15:15:16	-15:15:16	-15:15:16	-15:15:16	-15:15:16
(C)(25)	-17:84:17	-17:88:17	-14:34:13	-12:51:02	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91	-10:24:91
(L)(25)	-18:31:17	-18:51:18	-18:02:12	-18:71:14	-18:69:14	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11	-18:03:11
(R)(25)	5.35Pa	7.84Pa	1.31Pa	2.18Pa	3.25Pa	4.12Pa	5.01Pa	6.01Pa	7.12Pa	8.35Pa	9.78Pa	11.41Pa	13.27Pa	15.37Pa	17.72Pa	20.34Pa	24.17Pa	28.24Pa	33.57Pa	40.18Pa	48.07Pa	57.36Pa	68.04Pa	80.19Pa
(C)(25)	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18	11:51:18
(L)(25)	0.14	0.21	0.34	0.54	0.85	1.33	2.12	3.53	5.96	10.05	17.35	30.67	54.37	95.54	169.43	304.33	542.19	957.15	1694.82	3043.33	5421.91	9571.55	16948.22	30433.33
(R)(25)	0.31	0.47	0.74	1.17	1.84	2.85	4.48	7.13	11.15	17.35	27.13	42.26	65.36	101.54	158.21	245.14	374.57	565.97	859.91	1304.57	1979.15	3043.33	4692.54	7143.52
(C)(25)	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16	1:34:16
(L)(25)	0.19	0.28	0.44	0.68	1.06	1.64	2.53	3.92	6.01	9.35	14.4	22.15	34.31	53.03	80.33	121.15	183.61	277.46	420.74	633.67	957.15	1440.74	2181.52	3330.74
(R)(25)	0.49	0.74	1.14	1.74	2.65	4.03	6.14	9.35	14.4	22.15	34.31	53.03	80.33	121.15	183.61	277.46	420.74	633.67	957.15	1440.74	2181.52	3330.74	5041.52	7492.54
(C)(25)	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14	1:54:14
(L)(25)	0.24	0.36	0.54	0.81	1.21	1.81	2.71	4.06	6.14	9.35	14.4	22.15	34.31	53.03	80.33	121.15	183.61	277.46	420.74	633.67	957.15	1440.74	2181.52	3330.74
(R)(25)	0.63	0.95	1.43	2.16	3.25	4.96	7.47	11.25	17.15	26.07	39.51	59.44	89.43	134.4	202.74	304.33	457.52	685.25	1034.57	1560.11	2343.33	3542.54	5342.54	7942.54
(C)(25)	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12	2:14:12
(L)(25)	0.29	0.43	0.64	0.95	1.43	2.16	3.25	4.96	7.47	11.25	17.15	26.07	39.51	59.44	89.43	134.4	202.74	304.33	457.52	685.25	1034.57	1560.11	2343.33	3542.54
(R)(25)	0.77	1.16	1.74	2.62	3.93	5.84	8.76	13.25	20.07	29.95	44.94	67.54	101.54	152.13	225.14	341.57	509.91	759.15	1134.57	1704.57	2543.33	3812.54	5621.52	8330.74
(C)(25)	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10	2:35:10
(L)(25)	0.35	0.52	0.77	1.16	1.74	2.62	3.93	5.84	8.76	13.25	20.07	29.95	44.94	67.54	101.54	152.13	225.14	341.57	509.91	759.15	1134.57	1704.57	2543.33	3812.54
(R)(25)	0.95	1.43	2.16	3.25	4.96	7.47	11.25	17.15	26.07	39.51	59.44	89.43	134.4	202.74										



Radiated Composite Gain Data of 2.4GHz&5GHz

Appendix A

(H15°)	-16.71-18.88	-17.94-15.38	-10.86-6.84	3.59-1.65	-1.31-2.46	-3.78-4.35	-4.99-2.78	-1.61-1.22	-1.74-0.44	0.95-17.19	-12.86-6.84	-8.37-7.57	8.73-11.33	-14.11-18.28	-18.92-13.86	-9.88-4.82	-4.64-7.24	-10.81-1.54	4.28-2.24	-4.83-4.97	-3.07-3.25	2.92-4.81	5.31-6.92	9.54-17.37		
(H22.5°)	-18.96-17.78	-18.44-17.57	-18.44-17.58	4.06-2.12	-1.09-2.23	-5.07-4.35	-5.96-3.55	-2.56-1.53	-4.67-3.84	-12.13-11.33	-10.99-8.57	-7.84-7.06	8.36-10.4	-15.65-17.77	-17.61-13.13	-10.25-7.54	-4.9-5.5	7.83-7.72	9.81-9.78	-5.33-2.81	-1.29-1.81	3.47-4.53	8.91-8.69	-11.48-18.82		
(H30°)	-16.06-14.82	-18.46-18.67	-15.31-13.47	6.26-1.22	-2.47-3.51	5.77-4.49	-7.49-5.22	-2.9-3.8	-5.67-6.84	-17.11-18.35	-17.47-15.45	-14.31-11.81	-14.17-16.66	-15.62-17.77	-18.63-18.08	-12.41-11.21	-4.78-5.64	-11.82-12.29	6.90-7.25	9.31-9.87	-5.16-5.85	6.52-6.18	-10.92-13.48	-10.49-15.83		
(H37.5°)	-18.01-18.1	-18.51-18.49	-17.27-10.75	7.78-5	4.06-1.84	6.8-6.2	7.34-5.39	4.33-1.1	6.83-11.08	-17.41-19.34	-17.47-17.17	-13.11-11.62	-13.88-15.29	-18.69-17.1	-17.97-18.68	-16.03-17.58	6.43-7.84	-13.07-13.2	8.29-8.62	-6.83-0.4	3.71-4.2	7.69-9.48	-13.88-15.39	-17.31-18.3		
(H45°)	-17.11-18.15	-18.35-18.52	-18.58-11.98	8.54-2.26	3.54-3.94	6.84-7.5	7.49-8.85	6.6-8.25	6.27-8.24	-18.42-18.87	-18.74-19.13	-15.17-15.45	-15.48-14.34	-13.06-13.44	-14.32-15.98	-14.92-18.69	-18.48-8.89	-10.14-10.39	-17.45-10.68	7.44-8.92	5.91-8.7	5.11-8.27	-18.19-15.94	-16.14-18.58		
(H52.5°)	8.67-8.77	-11.88-14.88	-18.71-15.71	-10.2-0.26	8.82-7.18	-10.11-10.81	6.68-3.2	-4.78-8.62	8.78-14.7	-17.77-15.89	-13.16-13.95	-14.31-15.11	-13.51-10.67	8.21-10.42	-11.02-17.03	-17.98-14.94	-13.98-13.11	-14.52-13.96	-11.35-11.03	-10.91-10.4	8.31-10.98	-16.63-17.81	-17.49-18.7	-11.04-18.88		
(H60°)	-13.71-11.38	-13.14-18.84	-18.39-13.38	8.72-8.69	5.42-9.02	-11.02-10.67	-10.48-7.48	-7.34-5.83	6.09-12.32	-16.99-12.44	-8.78-8.84	-9.26-11.61	-13.68-11.74	-18.41-18.57	-17.89-17.53	-18.36-17.92	-13.34-18.01	-18.16-12.54	-12.37-13.57	-10.24-12.26	-17.31-18.62	-16.67-11.67	-9.63-8.84	-11.04-18.88		
(H67.5°)	-17.68-12.57	-13.18-18.81	-18.61-13.32	8.99-8.91	-7.47-8.79	-7.88-8.76	6.78-8.14	-7.33-7.86	-7.82-8.94	-13.81-11.08	-8.49-8.89	-10.99-16.27	-18.21-18.69	-18.46-18.14	-12.73-12.02	-15.12-14.91	-18.88-13.1	-10.99-16.31	-17.41-18.63	-10.99-13.1	-17.41-18.63	-18.14-18.4	-14.48-18.25	-15.15-15.15		
(H75°)	-16.72-10.57	-11.36-15.81	-18.2-17.9	10.71-10.76	10.8-8.79	8.97-8.32	-14.69-15.4	-11.89-16.41	-12.61-16.58	-12.67-17.95	3.86-8.69	-10.29-13.77	-17.95-18.57	-18.18-17.1	-18.38-18.9	-18.32-18.45	-15.12-15.66	-18.97-18.58	-14.38-10.2	-17.06-18.1	-18.32-18.45	-18.83-18.76	-18.32-17.21	-16.03-17.31		
(H82.5°)	-16.65-17.57	-16.49-17.98	-17.93-15.81	12.86-11.71	11.77-8.88	6.99-6.68	-7.54-8.04	8.19-9.57	-11.07-8.68	-7.46-8.24	4.8-3.3	-3.59-4.67	8.97-9.71	-18.04-18.34	-18.43-17.11	-15.05-15.29	-12.75-13.37	-16.22-17.78	-18.88-18.82	-17.44-17.83	-17.01-18.81	-17.95-18.2	-18.69-18.98	-18.51-18.42		
(H90°)	-18.77-17.51	-15.11-18.83	-18.84-18.48	9.91-6.01	4.52-8.38	4.36-5.2	5.73-6.37	6.83-8.31	8.92-10.68	-16.86-16.06	8.29-7.8	8.22-18.18	-11.11-15.15	-17.12-18.63	-14.56-18.96	-19.32-18.03	-18.18-18.75	-15.89-17.62	-17.97-17.65	-18.93-18.03	-18.15-18.56	-13.97-15.71	-18.31-18.25	-17.42-18.94		
(H97.5°)	8.28-8.92	-10.22-9.81	8.11-7.83	8.38-7.92	7.27-6.83	5.98-5.36	4.85-4.45	4.54-4.54	4.89-6.71	8.47-10.51	-12.41-12.43	-17.25-18.88	-12.14-9.83	8.75-8.83	-15.54-17.83	-18.54-18.87	-18.28-18.07	18.41-18.71	-15.84-18.68	-18.13-18.4	-18.18-18.45	-17.81-18.61	-15.59-11.94	-15.89-17.57		
(H105°)	8.67-8.77	-11.88-14.88	-18.71-15.71	-10.2-0.26	8.82-7.18	-10.11-10.81	6.68-3.2	-4.78-8.62	8.78-14.7	-17.77-15.89	-13.16-13.95	-14.31-15.11	-13.51-10.67	8.21-10.42	-11.02-17.03	-17.98-14.94	-13.98-13.11	-14.52-13.96	-11.35-11.03	-10.91-10.4	8.31-10.98	-16.63-17.81	-17.49-18.7	-11.04-18.88		
(H112.5°)	-13.71-11.38	-13.14-18.84	-18.39-13.38	8.72-8.69	5.42-9.02	-11.02-10.67	-10.48-7.48	-7.34-5.83	6.09-12.32	-16.99-12.44	-8.78-8.84	-9.26-11.61	-13.68-11.74	-18.41-18.57	-17.89-17.53	-18.36-17.92	-13.34-18.01	-18.16-12.54	-12.37-13.57	-10.24-12.26	-17.31-18.62	-16.67-11.67	-9.63-8.84	-11.04-18.88		
(H120°)	-17.68-12.57	-13.18-18.81	-18.61-13.32	8.99-8.91	-7.47-8.79	-7.88-8.76	6.78-8.14	-7.33-7.86	-7.82-8.94	-13.81-11.08	-8.49-8.89	-10.99-16.27	-18.21-18.69	-18.46-18.14	-12.73-12.02	-15.12-14.91	-18.88-13.1	-10.99-16.31	-17.41-18.63	-10.99-13.1	-17.41-18.63	-18.14-18.4	-14.48-18.25	-15.15-15.15		
(H127.5°)	-16.72-10.57	-11.36-15.81	-18.2-17.9	10.71-10.76	10.8-8.79	8.97-8.32	-14.69-15.4	-11.89-16.41	-12.61-16.58	-12.67-17.95	3.86-8.69	-10.29-13.77	-17.95-18.57	-18.18-17.1	-18.38-18.9	-18.32-18.45	-15.12-15.66	-18.97-18.58	-14.38-10.2	-17.06-18.1	-18.32-18.45	-18.83-18.76	-18.32-17.21	-16.03-17.31		
(H135°)	-16.65-17.57	-16.49-17.98	-17.93-15.81	12.86-11.71	11.77-8.88	6.99-6.68	-7.54-8.04	8.19-9.57	-11.07-8.68	-7.46-8.24	4.8-3.3	-3.59-4.67	8.97-9.71	-18.04-18.34	-18.43-17.11	-15.05-15.29	-12.75-13.37	-16.22-17.78	-18.88-18.82	-17.44-17.83	-17.01-18.81	-17.95-18.2	-18.69-18.98	-18.51-18.42		
(H142.5°)	-18.77-17.51	-15.11-18.83	-18.84-18.48	9.91-6.01	4.52-8.38	4.36-5.2	5.73-6.37	6.83-8.31	8.92-10.68	-16.86-16.06	8.29-7.8	8.22-18.18	-11.11-15.15	-17.12-18.63	-14.56-18.96	-19.32-18.03	-18.18-18.75	-15.89-17.62	-17.97-17.65	-18.93-18.03	-18.15-18.56	-13.97-15.71	-18.31-18.25	-17.42-18.94		
(H150°)	8.28-8.92	-10.22-9.81	8.11-7.83	8.38-7.92	7.27-6.83	5.98-5.36	4.85-4.45	4.54-4.54	4.89-6.71	8.47-10.51	-12.41-12.43	-17.25-18.88	-12.14-9.83	8.75-8.83	-15.54-17.83	-18.54-18.87	-18.28-18.07	18.41-18.71	-15.84-18.68	-18.13-18.4	-18.18-18.45	-17.81-18.61	-15.59-11.94	-15.89-17.57		
(H157.5°)	8.67-8.77	-11.88-14.88	-18.71-15.71	-10.2-0.26	8.82-7.18	-10.11-10.81	6.68-3.2	-4.78-8.62	8.78-14.7	-17.77-15.89	-13.16-13.95	-14.31-15.11	-13.51-10.67	8.21-10.42	-11.02-17.03	-17.98-14.94	-13.98-13.11	-14.52-13.96	-11.35-11.03	-10.91-10.4	8.31-10.98	-16.63-17.81	-17.49-18.7	-11.04-18.88		
(H165°)	-13.71-11.38	-13.14-18.84	-18.39-13.38	8.72-8.69	5.42-9.02	-11.02-10.67	-10.48-7.48	-7.34-5.83	6.09-12.32	-16.99-12.44	-8.78-8.84	-9.26-11.61	-13.68-11.74	-18.41-18.57	-17.89-17.53	-18.36-17.92	-13.34-18.01	-18.16-12.54	-12.37-13.57	-10.24-12.26	-17.31-18.62	-16.67-11.67	-9.63-8.84	-11.04-18.88		
(H172.5°)	-17.68-12.57	-13.18-18.81	-18.61-13.32	8.99-8.91	-7.47-8.79	-7.88-8.76	6.78-8.14	-7.33-7.86	-7.82-8.94	-13.81-11.08	-8.49-8.89	-10.99-16.27	-18.21-18.69	-18.46-18.14	-12.73-12.02	-15.12-14.91	-18.88-13.1	-10.99-16.31	-17.41-18.63	-10.99-13.1	-17.41-18.63	-18.14-18.4	-14.48-18.25	-15.15-15.15		
(H180°)	-16.72-10.57	-11.36-15.81	-18.2-17.9	10.71-10.76	10.8-8.79	8.97-8.32	-14.69-15.4	-11.89-16.41	-12.61-16.58	-12.67-17.95	3.86-8.69	-10.29-13.77	-17.95-18.57	-18.18-17.1	-18.38-18.9	-18.32-18.45	-15.12-15.66	-18.97-18.58	-14.38-10.2	-17.06-18.1	-18.32-18.45	-18.83-18.76	-18.32-17.21	-16.03-17.31		
FreeHq	5.28Pa	Theta: 1																								
Gain	(H°/90°)	(V15°/90°)	(H°/90°)	(V15°/90°)	(H°/90°)	(V15°/90°)	(H°/90°)	(V15°/90°)	(H°/90°)	(V15°/90°)	(H°/90°)	(V15°/90°)	(H°/90°)	(V15°/90°)	(H°/90°)	(V15°/90°)	(H°/90°)	(V15°/90°)	(H°/90°)	(V15°/90°)	(H°/90°)	(V15°/90°)	(H°/90°)	(V15°/90°)	(H°/90°)	(V15°/90°)
(H15°)	4.53-4.46	-1.32-3.87	-3.99-4.04	3.59-4.02	4.23-4.48	5.34-6.72	6.20-8.52	6.17-8.57	6.18-8.57	-14.21-16.89	-8.42-8.2	-6.89-4.65	-3.69-3.39	-2.71-2.29	2.51-2.86	2.81-3.53	4.47-1.16	5.97-1.46	9.12-10.88	-14.31-17.48	-17.92-14.48	-15.11-12.49	-10.73-8.74	6.96-11.9		
(H22.5°)	1.79-1.35	-1.41-1.51	-1.80-2.65	3.14-3.43	4.65-5.8	7.4-8.4	-15.96-15.86	-18.44-18.18	-14.91-16.78	-14.41-11.19	-10.69-9.27	-7.84-7.01	5.54-5.25	4.99-4.77	4.31-4.64	-4.83-4.84	4.84-4.82	5.2-5.9	6.44-7.94	9.34-12.71	-15.05-14.42	-11.31-8.57	6.4-9.43	-3.84-3.49		
(H30°)	0.4860-2.04	0.89-1.81	-2.90-3.68	5.33-7.17	6.19-12.27	-15.76-17.77	1.17-10.35	-14.37-12.81	-10.86-8.07	-6.27-9.18	7.06-7.18	6.21-6.27	6.32-6.05	6.00-6.46	6.84-7.4	6.84-6.45	6.68-6.67	6.67-6.44	7.26-7.96	9.83-7.6	9.25-10.96	8.93-7.6	3.27-1.74	-0.78-0.24		
(H37.5°)	0.31-8.33	2.84-1.2	0.29-0.77	-15.2-6.8	-4.06-16.82	-7.59-6.14	-13.41-12.76	-11.33-11.56	-10.58-10.27	-8.74-8.47	-6.71-7.07	-6.15-6.17	6.42-6.05	4.76-4.54	5.34-6.11	7.01-7.56	8.3-8.37	8.67-8.72	7.68-8.75	-10.53-11.41	8.29-8.05	2.71-4.16	-0.87-0.66	0.86-1.4		
(H45°)	0.66-0.49	0.90-1.13	0.54-1.09	4.85-4.63	4.56-4.73	7.18-6.97	-8.37-10.63	-13.11-12.09	-10.24-1.91	-6.05-7.84	-6.37-7.48	-6.2-6.21	3.92-3.63	4.09-4.28	6.37-6.38	9.4-9.59	10.83-11.43	10.88-13.05	-12.31-11.95	-11.90-10.66	7.42-7.91	2.92-1.99	-1.27-1.16	-1.19-1.13		
(H52.5°)	4.12-1.85	-0.28-0.34	0.1104	0.29-0.22	-1.25-2.96	-3.82-0.64	-8.71-14.27	-17.75-12.19	1.84-7.78	-8.27-8.38	-10.45-8.45	-4.58-3.24	3.29-2.59	2.41-1.36	-5.87-6.46	-14.27-10.36	-17.78-18.45	-13.24-9.54	-7.72-8.22	-12.18-11.81	8.91-8.02	4.22-4.74	-9.1-9.03	-4.65-4.38		
(H60°)	8.54-4.33	-1.64-1.72	1.130-7.9	0.431-3.4	2.94-3.99	-1.92-1.47	-7.86-9.72	-13.91-15.14	8.56-10.51	1.25-4.04	-2.25-4.40	-3.37-3.06	1.88-1.14	1.25-4.40	-5.07-6.11	-15.22-17.68	-16.82-11.48	-8.69-7.94	-3.86-4.63	3.3-3.72	6.96-10.77	-10.19-7.3	0.42-0.54	-0.68-0.63		
(H67.5°)	5.6-5.3	-2.64-1.39	-0.67-0.46	-0.68-1.69	2.82-3.46	5.96-6.52	8.48-11.12	-18.99-12.21	7.04-8.68	-7.86-8.43	8.44-6.49	5.08-7.38	2.86-2.57	-2.05-2.35	4.88-8.33	-18.46-17.43	-15.94-16.83	-18.23-10.89	7.49-8.21	8.84-8.68	6.76-6.11	7.07-8.96	7.67-7.27	9.45-7.55		
(H75°)	2.8-3.2	-1.6-0.86	-0.29-0.35	-0.51-1.83	-14.55-8.68	6.35-8.38	6.74-7.48	-11.06-11.6	-7.44-6.89	-10.15-11.96																



Radiated Composite Gain Data of 2.4GHz&5GHz

Appendix A

Large data table with columns for frequency ranges (MHz) and corresponding gain values in dBi. It includes sub-headers for different antenna configurations like Theta=0, Theta=15, etc., and lists various model numbers.



Radiated Composite Gain Data of 2.4GHz&5GHz

Appendix A

Gain	0°(°)	15°(°)	30°(°)	45°(°)	60°(°)	75°(°)	90°(°)	105°(°)	120°(°)	135°(°)	150°(°)	165°(°)	180°(°)	195°(°)	210°(°)	225°(°)	240°(°)	255°(°)	270°(°)	285°(°)	300°(°)	315°(°)	330°(°)	345°(°)
FreeHd	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa	5.66Pa
Gain	0°(°)	15°(°)	30°(°)	45°(°)	60°(°)	75°(°)	90°(°)	105°(°)	120°(°)	135°(°)	150°(°)	165°(°)	180°(°)	195°(°)	210°(°)	225°(°)	240°(°)	255°(°)	270°(°)	285°(°)	300°(°)	315°(°)	330°(°)	345°(°)
0°(°)	5.39(5.13)	5.61(5.66)	5.39(6.67)	4.76(7.78)	4.87(9.14)	-13(15.34)	-18.65(18.77)	-16.59(14.72)	-12.59(10.68)	-9(12.87)	-6.99(15.7)	-4.43(4.68)	-4.44(4.08)	-4.23(4.43)	5(6.16)	6.39(7.38)	9.34(11.15)	12.89(15.39)	18.79(18.21)	17.99(14.4)	12.47(11.58)	8.52(8.48)	7.5(6.57)	4.27(6.98)
15°(°)	2.73(3.02)	3.85(4.1)	4.66(6.73)	6.86(8.73)	8.6(11.53)	12.88(17.12)	18.34(18.3)	16.91(12.63)	12.92(10.68)	9.43(7.59)	6(15.06)	4.23(3.39)	3.14(3.5)	3.29(3.8)	4.33(5.15)	6.39(7.38)	9.34(11.15)	12.89(15.39)	18.79(18.21)	17.99(14.4)	12.47(11.58)	8.52(8.48)	7.5(6.57)	4.27(6.98)
30°(°)	2.81(2.96)	3.6(4.29)	5.19(5.42)	7.41(9.53)	9.44(10.81)	12.62(15.57)	18.16(18.5)	16.71(18.1)	12.74(13.55)	9.31(10.83)	5.86(5.37)	4.34(5.08)	3.44(3.88)	3.59(4.09)	4.76(5.24)	6.39(7.38)	9.34(11.15)	12.89(15.39)	18.79(18.21)	17.99(14.4)	12.47(11.58)	8.52(8.48)	7.5(6.57)	4.27(6.98)
45°(°)	2.62(3.9)	4.20(4.88)	5.6(6.73)	8.6(11.53)	11.5(13.74)	15.5(18.87)	21.7(21.7)	19.8(21.7)	14.5(17.5)	10.5(12.5)	6.5(9.5)	4.5(5.5)	3.5(4.5)	3.5(4.5)	4.5(5.5)	6.5(9.5)	9.5(12.5)	13.5(16.5)	18.5(18.5)	17.5(14.5)	12.5(11.5)	8.5(8.5)	7.5(6.5)	4.5(4.5)
60°(°)	2.52(5.83)	4.24(4.72)	5.6(6.73)	8.6(11.53)	11.5(13.74)	15.5(18.87)	21.7(21.7)	19.8(21.7)	14.5(17.5)	10.5(12.5)	6.5(9.5)	4.5(5.5)	3.5(4.5)	3.5(4.5)	4.5(5.5)	6.5(9.5)	9.5(12.5)	13.5(16.5)	18.5(18.5)	17.5(14.5)	12.5(11.5)	8.5(8.5)	7.5(6.5)	4.5(4.5)
75°(°)	2.81(2.96)	3.6(4.29)	5.19(5.42)	7.41(9.53)	9.44(10.81)	12.62(15.57)	18.16(18.5)	16.71(18.1)	12.74(13.55)	9.31(10.83)	5.86(5.37)	4.34(5.08)	3.44(3.88)	3.59(4.09)	4.76(5.24)	6.39(7.38)	9.34(11.15)	12.89(15.39)	18.79(18.21)	17.99(14.4)	12.47(11.58)	8.52(8.48)	7.5(6.57)	4.27(6.98)
90°(°)	2.62(3.9)	4.20(4.72)	5.6(6.73)	8.6(11.53)	11.5(13.74)	15.5(18.87)	21.7(21.7)	19.8(21.7)	14.5(17.5)	10.5(12.5)	6.5(9.5)	4.5(5.5)	3.5(4.5)	3.5(4.5)	4.5(5.5)	6.5(9.5)	9.5(12.5)	13.5(16.5)	18.5(18.5)	17.5(14.5)	12.5(11.5)	8.5(8.5)	7.5(6.5)	4.5(4.5)
105°(°)	2.52(5.83)	4.24(4.72)	5.6(6.73)	8.6(11.53)	11.5(13.74)	15.5(18.87)	21.7(21.7)	19.8(21.7)	14.5(17.5)	10.5(12.5)	6.5(9.5)	4.5(5.5)	3.5(4.5)	3.5(4.5)	4.5(5.5)	6.5(9.5)	9.5(12.5)	13.5(16.5)	18.5(18.5)	17.5(14.5)	12.5(11.5)	8.5(8.5)	7.5(6.5)	4.5(4.5)
120°(°)	2.81(2.96)	3.6(4.29)	5.19(5.42)	7.41(9.53)	9.44(10.81)	12.62(15.57)	18.16(18.5)	16.71(18.1)	12.74(13.55)	9.31(10.83)	5.86(5.37)	4.34(5.08)	3.44(3.88)	3.59(4.09)	4.76(5.24)	6.39(7.38)	9.34(11.15)	12.89(15.39)	18.79(18.21)	17.99(14.4)	12.47(11.58)	8.52(8.48)	7.5(6.57)	4.27(6.98)
135°(°)	2.62(3.9)	4.20(4.72)	5.6(6.73)	8.6(11.53)	11.5(13.74)	15.5(18.87)	21.7(21.7)	19.8(21.7)	14.5(17.5)	10.5(12.5)	6.5(9.5)	4.5(5.5)	3.5(4.5)	3.5(4.5)	4.5(5.5)	6.5(9.5)	9.5(12.5)	13.5(16.5)	18.5(18.5)	17.5(14.5)	12.5(11.5)	8.5(8.5)	7.5(6.5)	4.5(4.5)
150°(°)	2.52(5.83)	4.24(4.72)	5.6(6.73)	8.6(11.53)	11.5(13.74)	15.5(18.87)	21.7(21.7)	19.8(21.7)	14.5(17.5)	10.5(12.5)	6.5(9.5)	4.5(5.5)	3.5(4.5)	3.5(4.5)	4.5(5.5)	6.5(9.5)	9.5(12.5)	13.5(16.5)	18.5(18.5)	17.5(14.5)	12.5(11.5)	8.5(8.5)	7.5(6.5)	4.5(4.5)
165°(°)	2.81(2.96)	3.6(4.29)	5.19(5.42)	7.41(9.53)	9.44(10.81)	12.62(15.57)	18.16(18.5)	16.71(18.1)	12.74(13.55)	9.31(10.83)	5.86(5.37)	4.34(5.08)	3.44(3.88)	3.59(4.09)	4.76(5.24)	6.39(7.38)	9.34(11.15)	12.89(15.39)	18.79(18.21)	17.99(14.4)	12.47(11.58)	8.52(8.48)	7.5(6.57)	4.27(6.98)
180°(°)	2.62(3.9)	4.20(4.72)	5.6(6.73)	8.6(11.53)	11.5(13.74)	15.5(18.87)	21.7(21.7)	19.8(21.7)	14.5(17.5)	10.5(12.5)	6.5(9.5)	4.5(5.5)	3.5(4.5)	3.5(4.5)	4.5(5.5)	6.5(9.5)	9.5(12.5)	13.5(16.5)	18.5(18.5)	17.5(14.5)	12.5(11.5)	8.5(8.5)	7.5(6.5)	4.5(4.5)
195°(°)	2.52(5.83)	4.24(4.72)	5.6(6.73)	8.6(11.53)	11.5(13.74)	15.5(18.87)	21.7(21.7)	19.8(21.7)	14.5(17.5)	10.5(12.5)	6.5(9.5)	4.5(5.5)	3.5(4.5)	3.5(4.5)	4.5(5.5)	6.5(9.5)	9.5(12.5)	13.5(16.5)	18.5(18.5)	17.5(14.5)	12.5(11.5)	8.5(8.5)	7.5(6.5)	4.5(4.5)
210°(°)	2.81(2.96)	3.6(4.29)	5.19(5.42)	7.41(9.53)	9.44(10.81)	12.62(15.57)	18.16(18.5)	16.71(18.1)	12.74(13.55)	9.31(10.83)	5.86(5.37)	4.34(5.08)	3.44(3.88)	3.59(4.09)	4.76(5.24)	6.39(7.38)	9.34(11.15)	12.89(15.39)	18.79(18.21)	17.99(14.4)	12.47(11.58)	8.52(8.48)	7.5(6.57)	4.27(6.98)
225°(°)	2.62(3.9)	4.20(4.72)	5.6(6.73)	8.6(11.53)	11.5(13.74)	15.5(18.87)	21.7(21.7)	19.8(21.7)	14.5(17.5)	10.5(12.5)	6.5(9.5)	4.5(5.5)	3.5(4.5)	3.5(4.5)	4.5(5.5)	6.5(9.5)	9.5(12.5)	13.5(16.5)	18.5(18.5)	17.5(14.5)	12.5(11.5)	8.5(8.5)	7.5(6.5)	4.5(4.5)
240°(°)	2.52(5.83)	4.24(4.72)	5.6(6.73)	8.6(11.53)	11.5(13.74)	15.5(18.87)	21.7(21.7)	19.8(21.7)	14.5(17.5)	10.5(12.5)	6.5(9.5)	4.5(5.5)	3.5(4.5)	3.5(4.5)	4.5(5.5)	6.5(9.5)	9.5(12.5)	13.5(16.5)	18.5(18.5)	17.5(14.5)	12.5(11.5)	8.5(8.5)	7.5(6.5)	4.5(4.5)
255°(°)	2.81(2.96)	3.6(4.29)	5.19(5.42)	7.41(9.53)	9.44(10.81)	12.62(15.57)	18.16(18.5)	16.71(18.1)	12.74(13.55)	9.31(10.83)	5.86(5.37)	4.34(5.08)	3.44(3.88)	3.59(4.09)	4.76(5.24)	6.39(7.38)	9.34(11.15)	12.89(15.39)	18.79(18.21)	17.99(14.4)	12.47(11.58)	8.52(8.48)	7.5(6.57)	4.27(6.98)
270°(°)	2.62(3.9)	4.20(4.72)	5.6(6.73)	8.6(11.53)	11.5(13.74)	15.5(18.87)	21.7(21.7)	19.8(21.7)	14.5(17.5)	10.5(12.5)	6.5(9.5)	4.5(5.5)	3.5(4.5)	3.5(4.5)	4.5(5.5)	6.5(9.5)	9.5(12.5)	13.5(16.5)	18.5(18.5)	17.5(14.5)	12.5(11.5)	8.5(8.5)	7.5(6.5)	4.5(4.5)
285°(°)	2.52(5.83)	4.24(4.72)	5.6(6.73)	8.6(11.53)	11.5(13.74)	15.5(18.87)	21.7(21.7)	19.8(21.7)	14.5(17.5)	10.5(12.5)	6.5(9.5)	4.5(5.5)	3.5(4.5)	3.5(4.5)	4.5(5.5)	6.5(9.5)	9.5(12.5)	13.5(16.5)	18.5(18.5)	17.5(14.5)	12.5(11.5)	8.5(8.5)	7.5(6.5)	4.5(4.5)
300°(°)	2.81(2.96)	3.6(4.29)	5.19(5.42)	7.41(9.53)	9.44(10.81)	12.62(15.57)	18.16(18.5)	16.71(18.1)	12.74(13.55)	9.31(10.83)	5.86(5.37)	4.34(5.08)	3.44(3.88)	3.59(4.09)	4.76(5.24)	6.39(7.38)	9.34(11.15)	12.89(15.39)	18.79(18.21)	17.99(14.4)	12.47(11.58)	8.52(8.48)	7.5(6.57)	4.27(6.98)
315°(°)	2.62(3.9)	4.20(4.72)	5.6(6.73)	8.6(11.53)	11.5(13.74)	15.5(18.87)	21.7(21.7)	19.8(21.7)	14.5(17.5)	10.5(12.5)	6.5(9.5)	4.5(5.5)	3.5(4.5)	3.5(4.5)	4.5(5.5)	6.5(9.5)	9.5(12.5)	13.5(16.5)	18.5(18.5)	17.5(14.5)	12.5(11.5)	8.5(8.5)	7.5(6.5)	4.5(4.5)
330°(°)	2.52(5.83)	4.24(4.72)	5.6(6.73)	8.6(11.53)	11.5(13.74)	15.5(18.87)	21.7(21.7)	19.8(21.7)	14.5(17.5)	10.5(12.5)	6.5(9.5)	4.5(5.5)	3.5(4.5)	3.5(4.5)	4.5(5.5)	6.5(9.5)	9.5(12.5)	13.5(16.5)	18.5(18.5)	17.5(14.5)	12.5(11.5)	8.5(8.5)	7.5(6.5)	4.5(4.5)
345°(°)	2.81(2.96)	3.6(4.29)	5.19(5.42)	7.41(9.53)	9.44(10.81)	12.62(15.57)	18.16(18.5)	16.71(18.1)	12.74(13.55)	9.31(10.83)	5.86(5.37)	4.34(5.08)	3.44(3.88)	3.59(4.09)	4.76(5.24)	6.39(7.38)	9.34(11.15)	12.89(15.39)	18.79(18.21)	17.99(14.4)	12.47(11.58)	8.52(8.48)	7.5(6.57)	4.27(6.98)



Radiated Composite Gain Data of 6GHz

Appendix B

Freq(Hz)	6.175G	6.475G	6.695G	6.995G
Ant. 1 Max Gain (dBi)	2.62	2.46	2.28	3.06
Ant. 2 Max Gain (dBi)	2.13	2.19	3.4	2.53
Ant. 3 Max Gain (dBi)	2.96	2.22	2.03	3.37
Ant. 4 Max Gain (dBi)	3.02	2.13	2.41	2.78
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/75/187.5	Phi/90/187.5	Phi/75/82.5	Phi/60/97.5
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/37.5/345	Theta/75/337.5	Theta/75/330	Theta/75/315
Ant. 3 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/82.5/150	Phi/67.5/30	Theta/82.5/247.5	Theta/82.5/165
Ant. 4 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Phi/75/37.5	Phi/45/277.5	Phi/45/285	Phi/45/292.5
Max Gain (dBi)	3.02	2.46	3.4	3.37
DG [1SS] (dBi)	4.84	3.91	5.04	4.67
DG [2SS] (dBi)	3.02	2.46	3.4	3.37
DG [4SS] (dBi)	3.02	2.46	3.4	3.37



Radiated Composite Gain Data of 6GHz

Appendix B

Frequency	Theta (Degrees)																								
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75									
Theta(25)	0.091174	0.080334	0.061336	1.27141	1.0705	-0.29189	-3.2824	-0.83955	1.331	0.41121	-3.14443	-5.17644	6.26648	5.47459	4.1135	-0.99709	1.31214	2.18204	1.77165	2.04187	1.1402	0.520247	4.69635	-5.62465	
Phi(25)	2.39054	0.51038	1.41234	1.46078	0.28002	-2.29287	-3.311	0.67189	2.09128	0.31158	-2.81544	-4.844	-3.9464	4.28381	-3.07128	2.1114	0.3116	1.74165	1.08121	3.17473	0.81	2.88432	4.47549	-4.93042	
Theta(50)	-1.56105	-0.72037	0.19098	0.61802	0.84025	-0.66521	-2.78132	0.47122	0.716487	-1.79451	4.61332	-2.76149	-1.62266	-3.58023	-1.35071	0.76101	-0.09148	1.53089	1.54036	1.50425	1.11136	2.82036	-2.999374	-4.1238	
Phi(50)	0.411014	-0.59002	-0.27012	0.91058	0.8003	-0.73153	-0.14123	2.51225	0.76104	3.21289	-3.95408	4.99336	5.07611	6.56437	-3.36132	-2.62146	0.059117	0.21029	-0.71115	2.89194	0.44081	0.591246	5.131429	-3.91156	
Theta(75)	2.491074	0.58037	0.67148	3.46074	-4.12242	2.44025	0.57124	2.88624	0.45057	2.91613	-4.60336	-5.19277	7.20152	2.662	-0.990	-1.86147	3.32088	-1.51123	-1.86083	1.69105	1.1136	0.650248	-1.686283	-1.58151	
Phi(75)	4.171072	1.68263	3.44003	3.113	0.59243	2.29025	-0.28141	2.59109	0.99633	-1.15351	-2.38126	3.51613	6.15037	-2.77199	-1.11338	-1.11121	4.16135	1.18108	-0.7808	1.18089	0.87018	-1.21027	-3.318	-2.29432	
Theta(100)	2.41219	0.69135	2.48181	1.85952	-0.89246	4.14028	1.01251	-1.21213	-2.71128	-0.89634	-4.29468	6.18634	5.67141	-4.29217	-1.71033	-1.61068	3.35226	0.25103	0.29211	2.37165	1.11006	-3.15317	-4.1212	-2.36423	
Phi(100)	0.33101	0.6519	2.86277	0.97116	0.48041	4.9329	1.14189	1.50106	3.33339	5.47073	-3.37034	3.99132	3.88223	-3.31126	-2.04123	-1.36106	-1.68073	0.63265	2.12165	0.88039	3.69107	0.8839	0.93032		
Theta(125)	0.43002	0.65198	2.19203	0.93044	1.14406	5.07033	0.41051	0.81116	-3.32289	-1.88242	5.02436	-3.02354	-1.74104	-1.48114	-1.28014	-1.04178	3.5148	0.96044	-0.19266	2.88027	1.83058	-1.04061	0.64059	-1.32028	
Phi(125)	1.49936	0.81032	1.86064	1.49468	0.31942	2.9804	3.231376	2.22047	-2.27125	-2.52067	-1.75181	0.76188	1.21151	-2.22043	-2.61084	-1.191248	-3.19124	0.22102	-0.87073	2.87089	-0.32029	0.52039	-0.39158	-1.6617	
Theta(150)	0.59011	0.59148	1.83204	0.803104	1.27024	0.89216	8.56648	3.061163	3.370	-1.31327	-3.21927	2.69158	0.02919	2.87056	3.3523	5.65057	3.41266	0.46925	0.62074	0.97037	1.63181	0.61022	-1.59059	-1.32029	
Phi(150)	0.586109	0.570113	0.07146	0.43012	0.50057	0.28134	4.35401	-3.69223	-3.23386	-2.07126	3.21729	2.56214	2.03029	3.47127	-4.85058	5.14328	3.83341	0.85928	1.98111	-1.76154	3.50258	1.34129	2.8413	-1.98157	
Theta(175)	1.111072	2.91193	2.51015	3.09134	2.162	2.53047	1.04126	0.05046	-2.28154	2.19058	-0.78034	2.7109	1.04745	0.56136	2.53108	3.74058	4.37021	1.53039	0.88192	0.93131	0.71123	3.83145	3.23119	3.07182	
Phi(175)	4.19139	4.14171	4.60142	5.58179	-2.83374	-7.82019	1.53149	0.13177	-1.81286	3.34942	-3.94484	-5.21545	4.56147	-3.59167	1.64441	4.11116	0.73132	-0.69162	-0.51206	4.20136	-2.29179	3.26178	3.09121	2.92171	
Theta(200)	5.271487	4.39147	4.90136	3.82033	-3.25037	-4.89632	-1.8961	0.73018	2.12442	-1.34198	-1.52046	5.17017	6.63121	-5.26207	-3.07132	3.69138	-1.39149	0.56129	-1.71026	0.93169	0.60148	3.66162	3.97062	3.75068	
Phi(200)	1.545033	4.98077	6.17026	4.32038	-6.20248	-4.98242	0.09278	2.23026	-0.78125	-3.95173	-1.51141	2.25038	6.06032	-3.26146	-3.70248	2.15011	0.886102	-0.20978	-0.76148	3.92027	2.03144	4.67099	4.86045	-6.62045	
Theta(225)	2.360361	6.62041	-5.990416	-2.01105	-1.720182	-0.66025	0.90088	0.41048	-2.85035	-4.33054	-5.31039	-7.10083	6.08044	-4.290429	4.190326	-6.99043	-1.75026	0.86005	-0.53015	-0.62023	-1.290171	-3.94042	-10.01018	4.81011	
Phi(225)	4.840387	-4.960574	-4.62053	2.99048	-0.940703	0.54033	-1.76038	0.51037	0.320153	-3.07059	-5.96026	-7.11086	7.33061	-4.980288	8.41077	-4.80033	-2.11002	4.27015	5.61039	-6.19036	4.91068	5.61034	-8.89073	6.46076	
Theta(250)	0.731428	-8.21817	-7.650178	6.33048	4.77046	-3.28018	-1.61088	-1.87053	0.71229	4.88067	-7.98073	-6.98063	7.49088	8.820102	-4.110328	-5.95046	6.06016	6.44024	-1.06089	2.24032	3.31028	2.73037	4.03041	6.94048	
Phi(250)	5.390482	-3.56032	-3.56038	-4.06034	-2.91088	-0.75034	-0.81018	-1.86026	0.21034	-4.04061	-6.59035	-5.61043	-6.65038	-4.27054	-3.91037	-1.73013	-1.19019	-0.16019	-5.83088	-7.67081	8.91078	-9.51046	5.12046		
Theta(275)	5.31476	-5.07058	-4.57035	-3.65034	-2.67028	-3.46037	-6.17071	-7.55027	4.65051	-6.84048	-5.69029	6.34052	-7.86058	-5.62143	-3.16049	-3.02	2.89049	6.69034	-0.64038	-5.65054	3.91051	-4.51053	-1.45048	-0.49048	
Phi(275)	0.441862	-0.561012	-0.16028	0.74036	-0.14053	-0.94089	-0.39028	0.645728	6.81041	-7.01047	-6.85068	6.36057	-4.72013	-0.21023	0.81023	0.75015	-2.66029	2.61012	-0.50048	-0.67083	-4.29047	4.64026	-5.28038	-0.76048	
Frequency	6.8595GHz																								
Theta(0)	0.751015	-1.124	-2.02039	4.02042	-5.42038	6.24028	6.13047	5.02044	-2.92027	-1.81010	0.66019	-0.24037	0.72021	0.14035	0.43037	1.45028	4.39044	4.39048	-4.86042	3.95032	2.62042	-1.95042	1.76094	0.91032	
Phi(0)	2.01014	-1.9903	-0.32032	-3.71028	-5.06039	4.80024	-3.71033	-4.26073	3.93038	-2.99176	0.85038	-0.20035	0.18034	0.34035	0.44036	1.05028	2.95036	4.80078	4.81078	-4.81078	3.91078	1.99078	1.99078	2.29028	
Theta(5)	2.78023	1.37012	0.60038	-0.55027	-3.34078	-4.68029	3.96031	-3.55038	-1.97044	-2.31028	-1.63031	0.24016	0.77036	1.07034	0.79031	0.79031	0.79031	3.81033	4.19038	4.82033	4.81033	2.27027	2.22024		
Phi(5)	2.99027	1.33004	0.54013	-1.01014	-3.13033	-3.53045	2.98032	-0.62028	0.24016	-0.47017	-0.31038	0.80031	1.41031	0.21029	-0.88011	-1.79029	2.84037	4.16033	4.87032	4.83048	2.02031	1.68027	0.91027	2.52027	
Theta(10)	2.18003	0.51044	0.88037	2.08013	0.27058	3.07026	1.14045	0.65053	0.75027	-0.63052	0.80031	1.84034	1.42037	0.81017	-1.79027	3.51034	2.99027	2.78039	5.16015	-1.77027	1.14017	1.14017	3.92017	3.92017	
Phi(10)	2.87023	0.23013	-0.47047	-5.15037	-2.44071	-3.91048	-3.59037	-1.76040	-0.94067	-0.52024	0.38025	1.07017	1.97017	1.88018	1.98003	0.41019	-0.25014	-2.28012	-1.93036	-7.89047	1.32011	1.41018	1.99019	1.21013	
Theta(15)	0.25038	0.91033	-0.14044	0.74037	1.98091	-1.95029	3.83028	2.420158	-1.94026	-1.41026	-1.94026	1.71024	1.72024	1.97024	1.97024	1.97024	1.97024	1.97024	1.97024	1.97024	1.97024	1.97024	1.97024	1.97024	
Phi(15)	3.07024	2.35013	0.090214	1.26058	-0.75017	0.62037	0.39038	-0.0201	0.21017	0.22016	1.39044	2.37028	2.17068	1.87018	2.82024	1.93032	0.87026	3.44037	-2.25036	-5.89034	-0.27029	4.74054	4.27045	3.08031	
Theta(20)	1.34051	0.32043	0.04023	-4.98011	-1.130075	0.09013	0.05014	-0.99032	-0.16017	1.80017	1.74018	1.91012	1.97018	1.97018	1.97018	1.97018	1.97018	1.97018	1.97018	1.97018	1.97018	1.97018	1.97018	1.97018	
Phi(20)	2.42073	2.33088	-0.450123	3.55075	-2.75015	-1.78026	-0.39025	0.43035	0.31018	1.80035	0.24032	0.93046	1.402	2.04028	0.81017	0.12022	-1.11079	3.11027	-2.47043	-4.81037	3.10033	3.25032	3.78019	3.78019	
Theta(25)	1.16038	4.93016	1.070159	-3.19034	-1.8601	0.29012	-1.52043	-1.86016	-0.11012	-1.36014	0.86048	0.31016	1.27016	0.80034	0.31016	0.31016	0.31016	3.81033	3.81033	2.05041	-1.93019	0.92037	3.89034	1.99038	
Phi(25)	1.78029	1.95028	-2.37037	3.34017	4.02014	0.35049	-1.04082	2.47025	0.91068	0.88049	-0.85029	-3.41038	2.93019	0.17011	0.84014	-2.04014	-0.36023	0.68013	-1.88028	0.75041	2.89048	3.2201	2.04023	0.47018	
Theta(30)	0.32048	0.28049	-1.22055	0.65014	0.34012	-1.22048	-4.81023	2.8208	0.96048	0.41016	-3.71028	-5.18025	1.63013	-4.26013	-0.27014	-0.81034	-0.59014	0.50013	0.67014	0.71028	0.88044	1.91017	1.13033	3.60016	
Phi(30)	1.67057	0.46021	-0.16074	0.43068	1.88006	-0.16056	0.34033	2.73028	1.52026	-0.87078	0.02072	0.42014	-0.34029	-1.54026	-0.97025	-2.10021	-2.49019	0.17034	-1.10036	2.29063	-0.15055	1.55017	1.47043	-1.97014	
Theta(35)	1.37017	0.5304	0.59027	-1.52027	-1.38018	-1.57017	-1.82015	2.52057	0.81016	3.71047	-1.10021	-0.10021	0.24016	0.86048	0.31016	1.36018	-1.28026	0.27026	-3.0801	-0.15027	2.29016	0.87016	2.27013	-1.84014	
Phi(35)	1.32072	2.61029	3.85026	1.33058	0.68024	0.07014	-0.11011	1.26019	-1.19023	-1.25024	-1.02091	-1.43089	0.52052	0.47015	-1.83039	-2.46036	4.88071	6.47047	-2.8706	0.51041	-2.79019	0.69027	4.62038	0.36021	
Theta(40)	0.23016	-1.86022	1.35053	-3.02024	0.93026	-1.76034	-1.81006	0.28013	-0.72024	-0.67019	-1.20031	-2.74018	-2.74018	-2.74018	-2.74018	-2.74018	-2.74018	0.64027	-3.93088	-6.06071	8.66071	8.66071	-1.09088		
Phi(40)	2.84039	2.86039	-0.42037	3.18023	-1.83015	-1.09085	-2.34049	-0.31051	1.45022	0.95035	-5.4304														



Radiated Composite Gain Data of 6GHz

Appendix B

Gain Result

Freq(Hz)	6.175GHz	Theta(1)	Theta(2)	Theta(3)	Theta(4)	Theta(5)	Theta(6)	Theta(7)	Theta(8)	Theta(9)	Theta(10)	Theta(11)	Theta(12)	Theta(13)	Theta(14)	Theta(15)	Theta(16)	Theta(17)	Theta(18)	Theta(19)	Theta(20)	Theta(21)	Theta(22)	Theta(23)	Theta(24)	Theta(25)	Theta(26)	Theta(27)	Theta(28)	Theta(29)	Theta(30)	Theta(31)	Theta(32)	Theta(33)	Theta(34)	Theta(35)	
Gain	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000



Radiated Composite Gain Data of 6GHz

Appendix B

Model	Theta = 0°										Theta = 15°										Theta = 30°										Theta = 45°										Theta = 60°										Theta = 75°										Theta = 90°																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	Gain	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	Gain	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	Gain	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	Gain	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	Gain	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	Gain	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	Gain	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
(H125)	16.4218	16.8796	17.0215	17.2521	17.3731	17.4862	17.5828	17.6711	17.7528	17.8282	17.9007	17.9688	18.0341	18.0978	18.1608	18.2231	18.2849	18.3464	18.4077	18.4687	18.5295	18.5901	18.6506	18.7111	18.7716	18.8321	18.8926	18.9531	19.0136	19.0741	19.1346	19.1951	19.2556	19.3161	19.3766	19.4371	19.4976	19.5581	19.6186	19.6791	19.7396	19.8001	19.8606	19.9211	19.9816	20.0421	20.1026	20.1631	20.2236	20.2841	20.3446	20.4051	20.4656	20.5261	20.5866	20.6471	20.7076	20.7681	20.8286	20.8891	20.9496	21.0101	21.0706	21.1311	21.1916	21.2521	21.3126	21.3731	21.4336	21.4941	21.5546	21.6151	21.6756	21.7361	21.7966	21.8571	21.9176	21.9781	22.0386	22.0991	22.1596	22.2201	22.2806	22.3411	22.4016	22.4621	22.5226	22.5831	22.6436	22.7041	22.7646	22.8251	22.8856	22.9461	23.0066	23.0671	23.1276	23.1881	23.2486	23.3091	23.3696	23.4301	23.4906	23.5511	23.6116	23.6721	23.7326	23.7931	23.8536	23.9141	23.9746	24.0351	24.0956	24.1561	24.2166	24.2771	24.3376	24.3981	24.4586	24.5191	24.5796	24.6401	24.7006	24.7611	24.8216	24.8821	24.9426	25.0031	25.0636	25.1241	25.1846	25.2451	25.3056	25.3661	25.4266	25.4871	25.5476	25.6081	25.6686	25.7291	25.7896	25.8501	25.9106	25.9711	26.0316	26.0921	26.1526	26.2131	26.2736	26.3341	26.3946	26.4551	26.5156	26.5761	26.6366	26.6971	26.7576	26.8181	26.8786	26.9391	27.0001	27.0606	27.1211	27.1816	27.2421	27.3026	27.3631	27.4236	27.4841	27.5446	27.6051	27.6656	27.7261	27.7866	27.8471	27.9076	27.9681	28.0286	28.0891	28.1496	28.2101	28.2706	28.3311	28.3916	28.4521	28.5126	28.5731	28.6336	28.6941	28.7546	28.8151	28.8756	28.9361	29.0001	29.0606	29.1211	29.1816	29.2421	29.3026	29.3631	29.4236	29.4841	29.5446	29.6051	29.6656	29.7261	29.7866	29.8471	29.9076	29.9681	30.0286	30.0891	30.1496	30.2101	30.2706	30.3311	30.3916	30.4521	30.5126	30.5731	30.6336	30.6941	30.7546	30.8151	30.8756	30.9361	31.0001	31.0606	31.1211	31.1816	31.2421	31.3026	31.3631	31.4236	31.4841	31.5446	31.6051	31.6656	31.7261	31.7866	31.8471	31.9076	31.9681	32.0286	32.0891	32.1496	32.2101	32.2706	32.3311	32.3916	32.4521	32.5126	32.5731	32.6336	32.6941	32.7546	32.8151	32.8756	32.9361	33.0001	33.0606	33.1211	33.1816	33.2421	33.3026	33.3631	33.4236	33.4841	33.5446	33.6051	33.6656	33.7261	33.7866	33.8471	33.9076	33.9681	34.0286	34.0891	34.1496	34.2101	34.2706	34.3311	34.3916	34.4521	34.5126	34.5731	34.6336	34.6941	34.7546	34.8151	34.8756	34.9361	35.0001	35.0606	35.1211	35.1816	35.2421	35.3026	35.3631	35.4236	35.4841	35.5446	35.6051	35.6656	35.7261	35.7866	35.8471	35.9076	35.9681	36.0286	36.0891	36.1496	36.2101	36.2706	36.3311	36.3916	36.4521	36.5126	36.5731	36.6336	36.6941	36.7546	36.8151	36.8756	36.9361	37.0001	37.0606	37.1211	37.1816	37.2421	37.3026	37.3631	37.4236	37.4841	37.5446	37.6051	37.6656	37.7261	37.7866	37.8471	37.9076	37.9681	38.0286	38.0891	38.1496	38.2101	38.2706	38.3311	38.3916	38.4521	38.5126	38.5731	38.6336	38.6941	38.7546	38.8151	38.8756	38.9361	39.0001	39.0606	39.1211	39.1816	39.2421	39.3026	39.3631	39.4236	39.4841	39.5446	39.6051	39.6656	39.7261	39.7866	39.8471	39.9076	39.9681	40.0286	40.0891	40.1496	40.2101	40.2706	40.3311	40.3916	40.4521	40.5126	40.5731	40.6336	40.6941	40.7546	40.8151	40.8756	40.9361	41.0001	41.0606	41.1211	41.1816	41.2421	41.3026	41.3631	41.4236	41.4841	41.5446	41.6051	41.6656	41.7261	41.7866	41.8471	41.9076	41.9681	42.0286	42.0891	42.1496	42.2101	42.2706	42.3311	42.3916	42.4521	42.5126	42.5731	42.6336	42.6941	42.7546	42.8151	42.8756	42.9361	43.0001	43.0606	43.1211	43.1816	43.2421	43.3026	43.3631	43.4236	43.4841	43.5446	43.6051	43.6656	43.7261	43.7866	43.8471	43.9076	43.9681	44.0286	44.0891	44.1496	44.2101	44.2706	44.3311	44.3916	44.4521	44.5126	44.5731	44.6336	44.6941	44.7546	44.8151	44.8756	44.9361	45.0001	45.0606	45.1211	45.1816	45.2421	45.3026	45.3631	45.4236	45.4841	45.5446	45.6051	45.6656	45.7261	45.7866	45.8471	45.9076	45.9681	46.0286	46.0891	46.1496	46.2101	46.2706	46.3311	46.3916	46.4521	46.5126	46.5731	46.6336	46.6941	46.7546	46.8151	46.8756	46.9361	47.0001	47.0606	47.1211	47.1816	47.2421	47.3026	47.3631	47.4236	47.4841	47.5446	47.6051	47.6656	47.7261	47.7866	47.8471	47.9076	47.9681	48.0286	48.0891	48.1496	48.2101	48.2706	48.3311	48.3916	48.4521	48.5126	48.5731	48.6336	48.6941	48.7546	48.8151	48.8756	48.9361	49.0001	49.0606	49.1211	49.1816	49.2421	49.3026	49.3631	49.4236	49.4841	49.5446	49.6051	49.6656	49.7261	49.7866	49.8471	49.9076	49.9681	50.0286	50.0891	50.1496	50.2101	50.2706	50.3311	50.3916	50.4521	50.5126	50.5731	50.6336	50.6941	50.7546	50.8151	50.8756	50.9361	51.0001	51.0606	51.1211	51.1816	51.2421	51.3026	51.3631	51.4236	51.4841	51.5446	51.6051	51.6656	51.7261	51.7866	51.8471	51.9076	51.9681	52.0286	52.0891	52.1496	52.2101	52.2706	52.3311	52.3916	52.4521	52.5126	52.5731	52.6336	52.6941	52.7546	52.8151	52.8756	52.9361	53.0001	53.0606	53.1211	53.1816	53.2421	53.3026	53.3631	53.4236	53.4841	53.5446	53.6051	53.6656	53.7261	53.7866	53.8471	53.9076	53.9681	54.0286	54.0891	54.1496	54.2101	54.2706	54.3311	54.3916	54.4521	54.5126	54.5731	54.6336	54.6941	54.7546	54.8151	54.8756	54.9361	55.0001	55.0606	55.1211	55.1816	55.2421	55.3026	55.3631	55.4236	55.4841	55.5446	55.6051	55.6656	55.7261	55.7866	55.8471	55.9076	55.9681	56.0286	56.0891	56.1496	56.2101	56.2706	56.3311	56.3916	56.4521	56.5126	56.5731	56.6336	56.6941	56.7546	56.8151	56.8756	56.9361	57.0001	57.0606	57.1211	57.1816	57.2421	57.3026	57.3631	57.4236	57.4841	57.5446	57.6051	57.6656	57.7261	57.7866	57.8471	57.9076	57.9681	58.0286	58.0891	58.1496	58.2101	58.2706	58.3311	58.3916	58.4521	58.5126	58.5731	58.6336	58.6941	58.7546	58.8151	58.8756	58.9361	59.0001	59.0606	59.1211	59.1816	59.2421	59.3026	59.3631	59.4236	59.4841	59.5446	59.6051	59.6656	59.7261	59.7866	59.8471	59.9076	59.9681	60.0286	60.0891	60.1496	60.2101	60.2706	60.3311	60.3916	60.4521	60.5126	60.5731	60.6336	60.6941	60.7546	60.8151	60.8756	60.9361	61.0001	61.0606	61.1211	61.1816	61.2421	61.3026	61.3631	61.4236	61.4841	61.5446	61.6051	61.6656	61.7261	61.7866	61.8471	61.9076	61.9681	62.0286	62.0891	62.1496	62.2101	62.2706	62.3311	62.3916	62.4521	62.5126	62.5731	62.6336	62.6941	62.7546	62.8151	62.8756	62.9361	63.0001	63.0606	63.1211	63.1816	63.2421	63.3026	63.3631	63.4236	63.4841	63.5446	63.6051	63.6656	63.7261	63.7866	63.8471	63.9076	63.9681	64.0286	64.0891	64.1496	64.2101	64.2706	64.3311	64.3916	64.4521	64.5126	64.5731	64.6336	64.6941	64.7546	64.8151	64.8756	64.9361	65.0001	65.0606	65.1211	65.1816	65.2421	65.3026	65.3631	65.4236	65.4841	65.5446	65.6051	65.6656	65.7261	65.7866	65.8471	65.9076	65.9681	66.0286	66.0891	66.1496	66.2101	66.2706	66.3311	66.3916	66.4521	66.5126	66.5731	66.6336	66.6941	66.7546	66.8151	66.8756	66.9361	67.0001	67.0606	67.1211	67.1816	67.2421	67.3026	67.3631	67.4236	67.4841	67.5446	67.6051	67.6656	67.7261	67.7866	67.8471	67.9076	67.9681	68.0286	68.0891	68.1496	68.2101	68.2706	68.3311	68.3916	68.4521	68.5126	68.5731	68.6336	68.6941	68.7546	68.8151	68.8756	68.9361	69.0001	69.0606	69.1211	69.1816	69.2421	69.3026	69.3631	69.4236	69.4841	69.5446	69.6051	69.6656	69.7261	69.7866	69.8471	69.9076	69.9681	70.0286	70.0891	70.1496	70.2101	70.2706	70.3311	70.3916	70.4521	70.5126	70.5731	70.6336	70.6941	70.7546	70.8151	70.8756	70.9361	71.0001	71.0606	71.1211	71.1816	71.2421	71.3026	71.3631	71.4236	71.4841	71.5446	71.6051	71.6656	71.7261	71.7866	71.8471	71.9076	71.9681	72.0286	72.0891	72.1496	72.2101	72.2706	72.3311	72.3916	72.4521	72.5126	72.5731	72.6336	72.6941	72.7546	72.8151	72.8756	72.9361	73.0001	73.0606	73.1211	73.1816	73.2421	73.3026	73.3631	73.4236	73.4841	73.5446	73.6051	73.6656	73.7261	73.7866	73.8471	73.9076	73.9681	74.0286	74.0891	74.1496	74.2101	74.2706	74.3311	74.3916	74.4521	74.5126	74.5731	74.6336	74.6941	74.7546	74.8151	74.8756	74.9361	75.0001	75.0606	75.1211	75.1816	75.2421	75.3026	75.3631	75.4236	75.4841

Radiated Composite Gain Data of 6GHz

Appendix B

(15)75.1	11:55:11.44	-10.31:8.41	-6.72:-12.84	-13.53:-12.56	-11.05:7.42	6.02:6.81	6.1:7.39	6.23:-13.27	6.5:7.48	7.8:7.24	6.14:6.25	6.82:-12.11	-12.01:-13.59	-10.48:8.84	7.32:7.74	-6.91:6.09	6.89:6.68	6.59:6.28	5.16:6.03	6.06:10.37	-14.82:-17.98	-17.59:15.48	-15.23:16.44	-18.82:-18.18					
(15)75.2	11:31:10.11	-11.37:13.11	-14.53:-13.34	-17.67:15.65	-11.96:7.99	6.59:4.28	3.41:4.15	3.85:4.47	6.63:7.47	6.1:11.53	-14.07:18.38	-18.17:14.47	-11.28:6.61	-10.511	-6.93:10.14	-10.97:6.56	8.26:8.5	8.48:7.48	4.96:6.31	-10.28:12.72	-16.21:17	-18.12:-17.68	-18.63:16.1	-14.04:13.1					
(15)75.3	8.64:6.28	-5.77:13.44	-8.36:13.68	-17.08:18.14	-18.54:17.66	-15.05:6.74	5.98:4.57	3.91:3.82	3.34:3.44	6.39:6.72	1.60:1.37	-4.07:18.16	-10.24:10.66	-10.56:12.54	-10.71:8.3	6.18:4.17	4.22:6.14	4.22:6.64	-1.76:10.93	-13.94:12.68	-15.93:15.69	-18.72:18.73	-18.39:16.17	-17:12:12					
(15)80.1	14.37:12.81	-12.88:1.13	-12.55:-17.19	-17.81:16.87	-18.88:15.07	-12.46:12.27	-15:15.17	-15:15.13	-14.62:13.34	-12.49:14.28	-12.56:12.13	-12.61:14.01	-14.31:14.84	-13.87:13.43	-12.91:12.7	-11.79:12.12	-13:11.22	-10.64:9.72	9.48:8.89	7.57:14	7.3:6.81	6.61:7.32	8.82:7.62	-10:51:17.1					
Freq(Hz)	Theta(Az)	Theta(El)		Phi(90/0/25/75)		Phi(90/0/90/25)		Phi(90/0/180/25)		Phi(90/0/135/225)		Phi(90/0/150/150)		Phi(90/0/165/180)		Phi(90/0/210/25)		Phi(90/0/225/25)		Phi(90/0/240/45)		Phi(90/0/285/25)		Phi(90/0/300/75)		Phi(90/0/330/75)		Phi(90/0/345/75)	
Gain	Phi(90/0/75)	Phi(90/0/225)	Phi(90/0/315)	Phi(90/0/345)	Phi(90/0/360)	Phi(90/0/300)	Phi(90/0/270)	Phi(90/0/225)	Phi(90/0/180)	Phi(90/0/135)	Phi(90/0/90)	Phi(90/0/45)	Phi(90/0/0)	Phi(90/0/45)	Phi(90/0/90)	Phi(90/0/135)	Phi(90/0/180)	Phi(90/0/225)	Phi(90/0/270)	Phi(90/0/315)	Phi(90/0/345)	Phi(90/0/360)	Phi(90/0/300)	Phi(90/0/270)	Phi(90/0/225)	Phi(90/0/180)	Phi(90/0/135)	Phi(90/0/90)	Phi(90/0/45)
(15)75.1	11:58:10.30	-10.59:8.66	-8:8.66	8:6.11	57.1	-11.92:10.35	-11.3:14.7	-17.48:16.48	-17.81:15.1	-18.27:17.58	-18.91:17.97	-15.75:14.41	-13.48:12.08	-12:12.11	-12.21:11.92	-12.47:15.1	-14.73:15.41	-16.32:18.54	-18.91:10.58	-17.43:16.44	-15.85:17	-17.41:15.05	-17.64:17.57	-18.88:18.15	-15.18:13.28				
(15)75.2	11:47:16.82	-17.47:16.28	-15:17:17.87	-19:17:17.11	-17.57:16.22	-16.56:16.69	-16:40:13.37	-11:50:11.18	6.89:6.53	6:51:6.43	6:79:11.61	-10:36:10.63	-10:38:12.22	-14:11:13.71	-12:41:12.94	-13:30:13.37	-13:38:12.81	-13:78:12.55	-18:41:16.29	-17:41:17.76	-18:16:18.53	-17:65:19.35	-17:65:19.35	-18:32:18.29	-15:82:19.28				
(15)75.3	8:36:9.7	-12:18:14.2	-12:43:14.37	-16:48:18.31	-11:17:16.14	-18.77:16.45	-14:20:12.69	-8:64:6.81	5.89:5.53	4.91:4.64	7.49:6.03	-10:08:12.26	-10:38:12.26	-14:11:13.71	-12:41:12.94	-13:30:13.37	-13:38:12.81	-13:78:12.55	-18:41:16.29	-17:41:17.76	-18:16:18.53	-17:65:19.35	-17:65:19.35	-18:32:18.29	-15:82:19.28				
(15)25.5	2:36:5.55	4:89:7.16	7:62:6.37	6:07:10.66	-14:46:15.85	-14:11:10.02	7:85:7.12	6:17:6.14	4:91:3.96	4:24:4.62	7:14:8.57	-10:31:13.77	-14:61:15.91	-11:23:10.13	-11:64:14.71	-12:53:9.29	7:49:6.4	-10:15:13.22	-18:83:18.94	-17:85:17.58	-13:26:12.72	7:86:7.56	4:39:7.35	2:34:1.83					
(15)25.6	3:36:51.25	-7:88:12.53	-18:12:17.77	-16:51:14.94	-13:07:11.94	-12:33:12.56	-10:33:6.68	-4:47:2.4	2:52:2.03	3:14:4.89	9:53:11.71	-11:06:10.13	7:78:6.02	6:55:6.54	-12:56:12.86	6:81:11.83	4:14:12:11.87	6:74:10.08	-10:77:15.16	-16:08:12.36	9:24:6.81	4:46:3.15	2:28:2.26	2:41:2.47					
(15)25.7	6:31:93.14	-6:17:17.95	-17:51:16.87	-14:09:12.63	7:52:6.36	6:26:6.47	6:38:6.14	13:35:6.66	4:25:4.47	7:07:7.07	3:72:2.22	1:79:2.81	4:47	4:33:3.57	3:32:4.83	6:61:6.76	6:75:6.46	6:52:6.56	6:45:6.44	-11:49:15.84	6:11:13.71	2:13:1.48	-1:59:2:76	3:48:4.49					
(15)25.8	4:68:4.7	-6:07:10.92	-14:78:13.35	-12:87:10.85	9:8:8.8	9:8:8.8	9:17:14.14	-13:63:13.3	1:51:1.47	-6:25:6.23	-2:03:2.28	2:73:2.11	1:81:2.48	4:3:3.6	4:3:3.6	4:3:3.6	4:3:3.6	4:3:3.6	4:3:3.6	4:3:3.6	4:3:3.6	4:3:3.6	4:3:3.6	4:3:3.6	4:3:3.6				
(15)25.9	1:76:17.22	2:42:6.8	10:79:16.71	9:52:6.3	8:04:12.4	-12:13:6.86	6:59:4.14	9:59:5.53	1:34:2.28	7:58:4.84	1:49:1.36	2:44:6.19	6:18:4.81	3:62:4	3:62:4	3:62:4	3:62:4	3:62:4	3:62:4	3:62:4	3:62:4	3:62:4	3:62:4	3:62:4	3:62:4				
(15)26.1	4:14:17.28	3:08:6.46	5:89:7.67	10:89:8.01	6:39:10.33	6:48:7.67	3:62:7.2	6:12:8.51	3:19:2.84	2:52:2.26	6:81:11.83	3:21:3.23	3:21:3.23	3:21:3.23	3:21:3.23	3:21:3.23	3:21:3.23	3:21:3.23	3:21:3.23	3:21:3.23	3:21:3.23	3:21:3.23	3:21:3.23	3:21:3.23	3:21:3.23				
(15)26.2	1:28:4.66	5:89:7.42	-15:72:18.27	-11:49:15.47	4:7:1.3	-10:58:9.46	2:98:2.73	2:82:2.73	-1:04:1.56	2:33:1.4	-4:32:0.21	-4:07:0.36	0:38:1.59	-1:43:2.76	-11:08:12.22	3:34:12.3	5:2:9.33	10:42:16.48	-4:58:6.86	-5:18:5.76	8:41:11.68	-8:89:8.14	0:99:1.9	1:48:8.02	-1:48:8.02				
(15)26.3	1:48:8.02	6:58:7.33	-14:91:14.59	-10:59:6.31	2:87:3.16	-5:16:2.8	2:88:2.72	9:62:8.53	1:8:2.8	6:85:6.52	2:61:6.45	6:88:6.42	0:22:1.73	1:34:0.59	6:42:4.22	7:15:1.49	2:38:1.78	1:14:0.12	4:57:4.26	3:57:4.74	8:74:11.71	6:90:7.18	2:37:0.44	3:48:4.49	3:48:4.49				
(15)25.5	2:57:53.53	4:81:6.38	-15:29:17.88	8:81:8.44	3:58:3.2	4:01:8.42	6:88:6.46	7:48:10.12	-7:29:3.32	2:19:1.52	2:19:1.52	2:61:6.42	3:03:3.36	1:14:1.11	0:3:7	4:52:12.17	2:71:5.4	7:07:6.74	7:34:5.68	4:89:4.88	4:89:4.88	4:89:4.88	4:89:4.88	4:89:4.88	4:89:4.88				
(15)25.6	9:39:6.46	4:84:6.91	-11:84:6.88	8:97:8.72	7:17:2.6	2:30:3.34	4:70:10:52	4:57:1.37	3:89:3.82	2:69:2.24	2:26:2.16	5:33:2.43	2:08:1.42	-1:17:7:53	-1:77:8:5	-6:88:7.46	2:26:1.43	7:89:6.04	-6:88:7.46	-6:88:7.46	-6:88:7.46	-6:88:7.46	-6:88:7.46	-6:88:7.46	-6:88:7.46				
(15)25.7	5:19:12.72	3:07:17.22	-17:58:18.38	4:62:7.77	1:46:21.51	2:36:1.37	5:33:1.74	8:48:2.28	2:74:1.84	3:69:1.37	6:07:6.58	7:77:12.72	1:19:3.38	6:45:6.93	1:38:4.31	6:32:7.12	4:48:4.77	3:27:0.44	3:33:3.47	3:33:3.47	3:33:3.47	3:33:3.47	3:33:3.47	3:33:3.47	3:33:3.47				
(15)25.8	2:14:26.28	3:16:6.11	5:71:10.2	7:59:4.71	2:16:1.77	1:68:2.91	1:41:13:53	3:07:1.63	5:04:1.61	3:33:4.07	7:56:5.56	0:71:6.57	7:29:5.23	3:31:10.64	1:35:12.39	11:00:13.80	4:89:1.36	18:7:14.87	4:82:3.55	2:88:3.54	13:6:5	13:6:5	13:6:5	13:6:5	13:6:5				
(15)25.9	6:02:1.98	2:12:10.84	2:34:6.4	4:09:15.9	9:22:7.99	9:40:4.4	9:19:4.5	3:00:3.4	4:3:4.2	5:53:2.92	4:02:15.57	5:68:5.35	3:07:1.92	2:27:4.46	-10:21:11.91	6:87:7.55	6:87:7.55	6:87:7.55	6:87:7.55	6:87:7.55	6:87:7.55	6:87:7.55	6:87:7.55	6:87:7.55	6:87:7.55				
(15)25.1	3:34:14.34	7:29:6.52	-10:12:10.68	8:68:4.66	4:93:3.1	2:31:1.87	6:23:7.31	-10:75:9.08	1:06:0.46	3:74:6.48	2:82:2.67	6:71:6.17	4:72:6.63	3:32:4.57	3:29:6.75	-11:11:11.69	4:16:14.41	4:48:9.02	7:78:10.56	9:39:12.99	-11:17:11.37	-13:25:11.3	4:57:1.91	6:25:2.93					
(15)25.2	1:48:10.23	1:12:57.91	5:24:8.39	8:62:5.19	6:48:9.82	-13:88:19.22	-12:16:12.51	2:44:3.2	6:48:9.82	-3:27:4.66	6:52:5.09	-14:79:17.17	-13:87:10.77	-13:87:10.77	-13:87:10.77	-13:87:10.77	-13:87:10.77	-13:87:10.77	-13:87:10.77	-13:87:10.77	-13:87:10.77	-13:87:10.77	-13:87:10.77	-13:87:10.77					
(15)25.3	-1:14:10.13	4:45:6.44	-7:07:16.18	-3:39:2.42	-1:12:10.98	2:03:3.68	6:31:6.51	2:89:1.74	-2:07	-12:59:10.44	8:07:4.88	6:34:4.63	6:71:7.21	7:26:7.01	7:33:3.18	-15:89:14.88	-10:73:16.89	6:12	4:42:6.82	3:27:1.6	-1:51:11.58	-12:29:6	-8:07:11.94	-7:31:14.1					
(15)25.4	1:74:4.88	1:45:16.66	8:06:17.8	5:2:4.4	4:84:15.43	4:90:4.38	4:96:8.82	-11:32:4.97	3:9:4.42	-1:57:11.92	-10:73:16.18	-11:04:11.21	6:47:7.12	6:32:6.75	-10:10:10.88	-15:12:8.85	-16:61:7.82	6:27:10.77	7:13:10.77	3:25:1.66	2:39:13.29	1:45:12.17	6:60:13.35	-10:57:11.7					
(15)25.5	8:56:7.12	6:01:7.23	-6:53:7.76	-7:68:6.09	4:84:6.05	3:51:1.87	2:21:3.1	-5:33:11.24	-18:90:10.68	7:72:7.76	-5:04:7.04	-15:28:10.64	6:86:11:24	-11:34:15.15	-13:62:15.16	9:27:6.82	-11:25:12.75	-16:72:15.89	8:33:7.29	2:22:16.18	-7:97:8.53	5:06:7.77	-10:11:14.57						
(15)25.6	9:57:17.57	-13:26:10.96	-17:53:15.59	-13:01:12.63	-10:49:8.35	8:46:7.75	9:07:10:56	-11:51:13.63	-11:59:12.39	-11:59:12.39	-11:59:12.39	-11:59:12.39	-11:59:12.39	-11:59:12.39	-11:59:12.39	-11:59:12.39	-11:59:12.39	-11:59:12.39	-11:59:12.39	-11:59:12.39	-11:59:12.39	-11:59:12.39	-11:59:12.39	-11:59:12.39					
(15)25.7	6:71:17.36	-11:31:15.06	-18:31:18.25	-16:29:14.62	-18:02:15.99	-16:88:16.42	-18:02:15.99	-16:77:16.43	-11:74:10.24	-2:49:16.48	-11:80:11:43	6:59:6.62	6:66:7.75	6:89:6.8	6:29:6.85	-12:74:17:63	18:75:15.84	-11:37:17.59	-10:53:18:62	18:75:15.84	6:79:6.72	4:84:7.43	5:19:6:18	-13:45:15:56					
(15)80.1	17:54:13.68	-11:07:8.69	-10:13:11.18	15:86:15.98	-18:66:16.86	-16:99:14.88	-14:22:16.32	14:34:17.99	-19:48:18.19	-18:10:14.69	-17:63:18:14	-14:19:12:85	-11:31:12.18	-11:34:13:59	-13:82:12:83	-14:11:14:35	18:45:16.16	-18:87:16:28	-17:21:15:27	-12:19:14.74	6:48:7.1	6:42:6.47	7:54:7.79	-11:85:17:12					
Freq(Hz)	Theta(Az)	Theta(El)		Phi(90/0/25/75)		Phi(90/0/90/25)		Phi(90/0/180/25)		Phi(90/0/135/225)		Phi(90/0/150/150)		Phi(90/0/165/180)		Phi(90/0/210/25)		Phi(90/0/225/25)		Phi(90/0/240/45)		Phi(90/0/285/25)		Phi(90/0/300/75)		Phi(90/0/330/75)		Phi(90/0/345/75)	
Gain	Phi(90/0/75)	Phi(90/0/225)	Phi(90/0/315)	Phi(90/0/345)	Phi(90/0/360)	Phi(90/0/300)	Phi(90/0/270)	Phi(90/0/225)	Phi(90/0/180)	Phi(90/0/135)	Phi(90/0/90)	Phi(90/0/45)	Phi(90/0/0)	Phi(90/0/45)	Phi(90/0/90)	Phi(90/0/135)	Phi(90/0/180)	Phi(90/0/225)	Phi(90/0/270)	Phi(90/0/315)	Phi(90/0/345)	Phi(90/0/360)	Phi(90/0/300)	Phi(90/0/270)	Phi(90/0/225)	Phi(90/0/180)	Phi(90/0/135)	Phi(90/0/90)	Phi(90/0/45)
(15)75.1	12:41:70.54	-10:22:18.3	-16:12:16.83	-16:58:14.41	-11:81:9.87	-10:88:8.66	4:22:2.87																						



Radiated Composite Gain Data of 6GHz

Appendix B

(θ)	0.5413.43	4.6916.38	-8.914.76	-12.137.62	-5.372.28	6.6414.54	-15.417.83	-3.611.35	-3.313.34	-7.2617.71	-19.2417.96	-14.4617.16	-11.3112.9	-10.3913.21	-12.9513.08	-14.1112.33	-13.221.74	-3.281.71	-5.948.11	-8.616.79	-2.722.95	-2.352.06	-9.416.77	-8.094.19
(φ)	4.392.91	5.413.05	2.11-9.4	-3.24-3.4	-1.1210.33	5.7916.74	-5.923.1	-1.88-2.6	-4.09-4.7	-12.5715.07	-12.8513.02	-11.9113.89	-10.1113.49	8.9514.78	-6.2610.81	-12.8613.3	-12.93-8.48	-3.417.78	-10.6313.41	-19.312.5	-5.692.06	-1.683.82	-13.614.68	7.618.28
(150)	-1.2121.22	6.673.16	4.79-6.56	-15.0916.21	-7.663.65	5.89-6.96	-3.693.22	-1.02-7.2	-4.543.62	-17.1018.98	-17.6919.44	-19.0819.31	-14.5717.72	-10.8416.33	-5.83-9.96	-6.4212.68	-8.2916.32	-7.919.93	8.5715.93	-12.7916.78	-10.7610.76	-1.7916.74	-1.9716.74	-8.4412.46
(115)	4.7610.93	-2.241.67	-1.291.67	9.9612.1	0.4110.97	-3.721.92	-10.431.66	2.221.56	8.615.71	8.0717.33	-10.7616.39	-10.3919.34	8.175.77	7.217.88	-6.0522.5	-10.7613.52	7.571.66	8.841.77	-12.1213.76	-5.5118.84	-8.7913.89	-3.4611.86	-14.2915.99	-3.9913.35
(90)	-4.234.89	7.811.27	2.141.88	3.368.41	2.3111.43	-1.854.33	3.7611.83	2.542.53	2.821.77	6.0610.85	-19.2314.38	8.0816.34	7.151.97	-8.991.32	9.4117.79	8.2612.36	6.2819.21	2.931.1	-10.9212.3	-7.078.99	-14.781.93	-15.671.82	-4.817.54	2.9311.05
(45)	-8.3914.47	-19.4113.6	-10.4912.39	-17.9619.67	-16.5112.73	8.861.6	7.954.75	2.161.84	2.0212.98	-3.3315.13	-11.9810.69	5.9316.67	2.0713.16	4.4913.32	-14.5215.41	6.851.89	6.3919.47	5.912.51	6.4314.15	6.1711.67	-17.7318.82	-11.6412.09	-8.9112.66	4.4618.48
(0)	-11.8817.57	-17.8115.14	-10.958.06	8.8410.19	-7.034.18	3.2111.7	-11.0311.72	-11.1718.46	8.291.66	-10.8914.4	-18.3111.7	-7.6916.02	4.516.68	-10.3917.1	8.7314.47	8.4819.63	-17.7719.75	3.771.89	8.05110.08	-12.516.51	4.8316.36	-17.931.97	-10.8913.43	-12.0715.96
(145)	7.0815.29	7.7911.87	-13.4912.4	-14.0717.57	2.7711.15	-2.931.53	-10.7110.74	-10.591.55	7.5316.42	9.4916.86	8.9510.52	9.9919.96	9.1711.10	-11.1510.77	-13.971.53	3.516.04	8.7912.19	-18.0211.87	8.3519.79	-10.3317.41	7.2912.11	-18.1418.19	-15.1317.91	-15.9113.07
(135)	-12.0319.53	-11.0919.79	-7.8416.88	-11.0211.37	-16.1913.17	-8.6917.17	-10.1517.23	5.4914.63	4.4719.79	6.8115.8	7.8615.66	6.5115.96	5.1216.43	-10.9416.31	-19.0417.47	8.8417.89	7.3171.16	-15.8915.49	-14.7818.71	-18.8314.48	-10.3816.62	5.7317.79	-10.8216.87	-16.2918.67
(120)	-14.9613.37	-10.1919.99	-11.4413.71	-16.2913.97	-12.9116.05	-17.8718.17	-18.3916.04	-13.6215.92	-13.4410.71	-12.415.57	-4.932.73	2.9533.37	3.673.37	3.3412.97	2.714.1	6.3316.52	9.0711.22	-14.9717.88	-16.2915.52	7.3897.25	8.1217.71	9.4514.62	-18.4516.87	-18.2318.67
(105)	-13.8814.16	-12.3413.83	-13.6112.58	-12.7912.89	-13.2613.01	-12.7614.69	-15.9113.52	-12.9710.48	-7.9815.59	-4.4713.52	2.9121.42	2.1311.83	2.131.89	4.9917.92	8.310.17	-16.5518.67	16.2617.85	-15.2613.21	-12.4214.01	-14.0716.56	-16.7117.59	-18.5517.38	-18.4414.41	
(90)	-7.5317.41	-7.1717.37	-7.8218.16	-8.7711.88	-11.6112.78	-11.6712.44	-11.4713.26	-18.8218.74	-18.118.24	-16.4615.96	-13.9311.16	-10.8111.48	-10.9311.08	-11.2611.06	8.1718.83	8.8919.99	-11.0211.64	-13.6216.11	-10.2218.15	-15.5818.01	-18.6317.85	-15.5414.04	-13.6112.83	-10.4517.28
FreqHz	6.99592P0																							
Gain	(φ/150)	(φ/115)	(φ/90)	(φ/45)	(φ/0)	(φ/145)	(φ/135)	(φ/120)	(φ/105)	(φ/90)	(φ/75)	(φ/60)	(φ/45)	(φ/30)	(φ/15)	(φ/0)	(φ/15)	(φ/30)	(φ/45)	(φ/60)	(φ/75)	(φ/90)	(φ/105)	(φ/120)
(φ)	-0.0718.87	-18.6517.17	-17.3916.94	-15.0313.83	-11.7319.9	8.6618.15	8.241.6	-7.7814.12	8.4918.75	-10.4511.43	-14.7616.39	-17.4319.05	-18.6117.75	-18.118	-14.1312.86	-11.6411.62	-12.2812.09	-10.1917.75	8.6618.7	9.70110.93	-11.1211.65	-11.4113.16	-15.2417.16	
(φ)	-17.8118.33	-18.1219.03	-14.7713.01	-14.3414.05	-13.2911.62	-11.3110.94	-10.5919.95	-10.7810.62	-10.0212.28	-13.1613.72	-14.0314.95	-15.5818.26	-18.2617.6	-18.2317.15	-18.141.51	-18.1416.95	-12.9612.95	-10.6413.8	-7.0915.65	-6.364.86	-5.9316.67	-7.0817.11	8.4314.17	-12.1215.86
(φ)	-15.9418.04	-18.1413.89	-17.0310	-10.0310	-8.221.69	-7.9417.46	-6.5417.88	-7.956.47	-10.2511.52	-11.1511.56	-12.1916.88	-18.4119.04	-18.1117.02	-17.9217.98	-18.4318.63	-18.0917.63	-13.6211.94	8.516.52	-6.1618.99	-3.8913.82	-2.7912.53	-2.913.49	8.4314.16	-7.8611.54
(φ)	-10.9117.88	5.9816.41	-5.814.99	5.9611.67	8.6516.84	-7.061.42	-5.315.01	4.815.15	5.6516.54	-7.9110.43	-11.1914.17	-16.9317.72	-17.4315.44	-14.1211.52	-11.0412.13	-12.4910.87	8.8319.64	8.2918.06	4.4612.87	0.4511.05	1.340.6	0.6812.39	-8.4718.06	-10.5217.31
(φ)	6.5514.05	-2.881.21	-2.914.34	-3.9914.67	5.4417.55	-10.2115.54	-3.661.33	4.2114.41	5.415.55	-15.2218.88	-17.2114.07	-10.7310.65	8.7819.28	-7.8612.34	-9.9811.53	-18.0217.99	-12.7919.49	4.7217.68	0.1701.84	0.4301.24	0.8712.36	-7.7117.37	-12.5811.84	
(φ)	8.61.42	-3.3812.37	-12.1013	0.9612.79	6.2111.54	9.7415.99	4.0913.72	4.341.38	-10.2818.64	-17.9114.12	-10.1918.08	-10.6410.102	8.4218.32	-7.8217.99	6.5316.67	8.2715.78	9.3216.72	4.4612.72	-1.4701.15	1.1911.29	0.9411.1	-4.6517.68	8.4311.27	-15.9818.79
(φ)	5.2414.53	-4.3713.07	-3.931.02	-1.7011.15	2.9718.56	-15.7317.39	-4.7914.04	-4.0415.36	-10.7918.83	-18.4718.03	-17.1118.23	-19.1417.88	-18.6411.75	-10.8218.48	-5.3314.49	-3.7916.86	6.5119.12	5.3812.32	-1.9801.5	2.2712.79	1.9701.75	-3.9213.74	-10.4817.13	-18.1911.68
(φ)	8.8416.04	5.2313.27	-3.6215.16	8.7912.54	-11.512.79	-14.9914.4	2.1511.89	-3.0117.11	-18.5119.2	-13.8913.17	-13.4712.15	-10.5910.22	9.3111.54	-18.3712.84	-7.4817.71	4.9713.92	5.6314.74	6.1210.43	-1.9601.63	1.9201.79	-1.1011.75	-1.9714.65	9.9219	-8.1116.88
(φ)	4.8513.13	3.0513.18	-1.6814.81	-13.7914.3	-11.3714.13	9.3121.14	-1.6812.28	-3.5614.48	-11.2319.42	-11.5211.94	-10.318.67	-10.4610.19	8.8611.19	-13.8611.87	-11.0216.68	4.9615.58	7.5016.93	4.2611.1	3.8617.26	1.2901.45	-0.5112.87	4.6717.35	8.1116.29	8.5117.96
(φ)	-13.515.97	2.6712.17	0.711.68	-10.1910.51	-2.19114.5	5.3816.26	8.3216.74	5.8816.78	-14.2618.21	-15.2019.45	8.1101.91	-11.4415.71	-17.8918.42	-18.4919.29	-12.3310.98	4.5915.95	8.3617.18	3.214.74	-3.5013.74	0.4610.02	2.5214.78	7.1817.84	-8.4417.85	-12.3417.88
(φ)	4.8413.23	-1.9616.99	8.0714.96	7.4413.37	4.4312.25	5.0718.39	11.7111.34	4.916.85	-13.9916.73	17.1319.19	8.2611.31	-14.1918.47	-12.7417.07	-19.7618.04	-10.715.98	9.2919.62	1.6917.23	2.7219.59	0.1816.13	2.5419.15	2.5415.77	4.9917.98	-11.4114.45	
(φ)	4.9211.68	6.181.87	1.701.95	3.4518.35	5.4311.96	-3.9718.9	-10.4518.83	8.2416.18	8.1614.15	6.9218.81	5.9116.62	8.6917.81	7.6516.23	8.0310.02	-12.3415.87	9.7311.41	9.7315.99	4.8612.77	3.7114.1	-12.2212.28	2.7312.7	4.2132	3.5114.63	-10.8017.96
(φ)	3.1911.98	-5.6119.18	-0.4110.74	-8.3418.43	-4.211.71	-2.9510.92	-7.5111.81	-7.6415.96	5.0711.92	-13.719.99	9.3310.32	7.018.41	5.4214.121	8.7711.82	-19.0417.95	-16.8617.01	-11.7919.54	5.5212.97	-2.86114.4	5.2113.9	-4.0912.12	2.5121.21	-4.5812.07	-8.2213.35
(φ)	2.5412	-1.1411.16	2.5314.24	18.7013.47	4.915.32	3.2712.76	4.3619.84	7.6513.96	-4.7711.37	-14.619.96	-13.3110.54	6.7816.82	8.3413.99	-10.9619.29	-10.5117.96	-16.9919.54	-19.2510.31	8.3314	4.6917.05	-15.3917.94	-2.2211.44	-1.8616.78	-10.6916.63	
(φ)	4.9413.24	3.841.82	5.8713.98	16.9812.52	9.8810.02	-7.4312.96	4.7414.21	-18.4819.19	1.9710.47	-14.4817.74	-16.4911.7	7.1517.6	8.5810.103	-13.7519.76	12.5312.17	-17.2316.33	-11.2915.57	4.7416.14	-1.9761.96	-18.7417.48	9.0116.46	4.7416.15	8.6714.48	
(φ)	5.8416.48	6.3911.85	-13.4418.99	-7.2915.54	-7.1212.32	6.4111.16	4.816.65	-14.1817.42	-5.9319.33	-2.4913.74	-8.9116.17	6.5811.81	8.4814.81	-16.3411.41	-14.1615.96	-17.3412.82	-11.2816.86	6.3115.88	-6.8418.68	-17.9719.02	-14.2312.61	3.2912.68	-4.4314.14	8.2614.61
(φ)	-7.2318.53	-7.7019.13	-15.2914.66	8.2916.02	-8.0514.99	-11.4919.38	-2.4924.26	-7.4116.21	-2.7111.68	-2.7124.49	-4.0914.95	-6.0812.44	-14.1414.88	-16.1113.13	-16.5516.45	-18.2317.11	-10.9819.82	6.5116.48	-14.8517.98	-19.9919.94	-12.1912.78	-7.9814.81	-4.9716.31	-7.9116.43
(φ)	-5.9113.1	-11.7018.19	-10.68113.73	-10.6919.34	5.8916.04	6.8817.78	4.5110.2	-17.8912.01	5.0215.22	5.913.68	-5.1913.67	-12.1718.69	-19.2211.96	-11.3111.31	-7.8917.32	9.2416.27	9.4310.65	8.9201.65	8.34119.29	-14.2916.87	-16.6616.25	-4.9119.89	-15.0519.83	
(φ)	-15.4518.16	-12.9818.17	-10.6913.31	5.8913.88	8.0318.13	-17.2518.94	-7.6614.32	6.0917.82	4.1512.18	-3.9114.26	7.3410.19	-16.7211.81	-12.4717.38	5.7416.96	-9.8516.81	-9.919.86	8.3210.58	-11.4611.81	-10.6316.88	-10.0510.68	3.1116.85	8.1511.801	-12.5311.64	
(φ)	-11.9817.95	6.9912.43	-5.613.3	-2.8814.97	7.1617.15	6.7413.76	-5.8514.39	-3.516	-17.7415.63	6.415.66	-6.8613.62	9.9118.58												



Antenna Pattern of 2.4GHz&5GHz

Appendix C

Total Gain Data

Frequency	2.4GHz	5GHz	0°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°	195°	210°	225°	240°	255°	270°	285°	300°	315°	330°	345°
0°	25.1301	32.5337	3.0513	3.7147	4.3498	4.9478	5.5145	6.0454	6.5461	7.0142	7.4565	7.8700	8.2529	8.6037	8.9308	9.2334	9.5111	9.7638	10.0004	10.2213	10.4261	10.6146	10.7864	10.9413	11.0800
30°	24.5848	32.5334	3.7131	3.1363	3.8914	4.6843	5.4974	6.1954	6.8448	7.4294	7.9542	8.4143	8.8049	9.1315	9.4004	9.6188	9.7839	9.9028	9.9738	10.0053	10.0053	10.0053	10.0053	10.0053	10.0053
45°	3.7502	3.2127	2.9422	2.2212	3.2884	3.0818	2.4032	3.5912	3.2938	2.4674	3.5046	3.5131	4.1045	4.4078	4.5719	4.6302	4.6727	4.7018	4.7192	4.7261	4.7238	4.7131	4.6954	4.6727	4.6459
60°	2.9524	2.0012	1.6916	1.1665	2.2522	2.0522	2.2927	2.7027	2.4620	2.2620	2.5020	2.5020	3.1020	3.6114	4.0114	4.2614	4.4614	4.6114	4.7114	4.7614	4.7714	4.7614	4.7414	4.7214	4.6914
75°	1.7612	1.2974	1.0164	0.8012	1.5522	2.0359	1.9618	1.7718	1.6614	1.5414	1.4114	1.3614	1.5614	1.7614	1.9614	2.1614	2.3614	2.5614	2.7614	2.9614	3.1614	3.3614	3.5614	3.7614	3.9614
90°	1.1514	0.4203	0.6901	0.5201	0.8712	1.1818	1.2518	1.3618	1.3918	1.4118	1.4218	1.4318	1.4418	1.4518	1.4618	1.4718	1.4818	1.4918	1.5018	1.5118	1.5218	1.5318	1.5418	1.5518	1.5618
105°	1.8013	0.6540	0.9317	0.4928	0.9382	1.3012	1.1712	1.1712	1.0112	0.9128	0.8212	0.7612	0.7212	0.7012	0.6912	0.6812	0.6712	0.6612	0.6512	0.6412	0.6312	0.6212	0.6112	0.6012	0.5912
120°	2.7219	2.0112	1.6698	1.0240	0.7012	1.7418	1.2618	1.0418	1.0418	0.8618	0.7618	0.7018	0.6618	0.6518	0.6418	0.6318	0.6218	0.6118	0.6018	0.5918	0.5818	0.5718	0.5618	0.5518	0.5418
135°	1.8944	0.9418	0.8126	2.0722	2.2418	0.9817	1.1914	1.1914	1.0912	0.9214	0.8410	0.8010	0.7910	0.7810	0.7710	0.7610	0.7510	0.7410	0.7310	0.7210	0.7110	0.7010	0.6910	0.6810	0.6710
150°	3.3013	3.3818	2.6722	3.0022	3.0022	2.4018	2.4018	0.8606	0.9918	1.0210	0.7512	0.8012	0.8612	0.9112	0.9612	1.0112	1.0612	1.1112	1.1612	1.2112	1.2612	1.3112	1.3612	1.4112	1.4612
165°	5.8742	1.8402	1.9103	3.8474	3.2718	0.8401	0.1802	0.9473	0.9943	0.0816	-0.8833	0.5166	0.5849	-0.8327	-2.5213	-3.0045	-3.3847	-3.6021	-3.7021	-3.7621	-3.7821	-3.7621	-3.7021	-3.6021	-3.4621
180°	5.3314	1.8402	2.1333	3.8638	3.4428	1.4203	0.9302	-0.0005	0.0905	0.5943	-1.2730	-0.7913	-0.4687	-0.3018	-0.2336	-0.2010	-0.1810	-0.1710	-0.1610	-0.1510	-0.1410	-0.1310	-0.1210	-0.1110	-0.1010
195°	4.9537	1.8891	1.4427	3.2621	2.5913	0.6014	0.2164	0.5456	0.5710	-1.3938	-0.7422	-1.4091	-1.0688	-0.8471	-0.6201	-0.4132	-0.2174	-0.1344	-0.0817	-0.0544	-0.0344	-0.0214	-0.0114	-0.0014	0.0014
210°	3.7912	1.6699	2.4953	4.2145	3.3028	1.1348	0.4108	0.6564	0.5540	-0.5514	-2.8748	-1.7498	-0.8875	-0.5540	-0.3586	-0.2610	-0.2010	-0.1610	-0.1310	-0.1010	-0.0810	-0.0610	-0.0410	-0.0210	-0.0110
225°	2.8918	1.7601	2.1237	3.6828	3.6283	1.9520	0.4801	0.4802	-0.3928	-0.9935	0.4914	-2.2937	-0.8943	-1.7797	-1.7979	-1.7979	-1.7979	-1.7979	-1.7979	-1.7979	-1.7979	-1.7979	-1.7979	-1.7979	-1.7979
240°	1.9213	1.6955	1.8892	4.1905	4.2934	2.7819	1.2615	1.0818	0.2898	-1.1693	1.4792	-1.9933	-0.5385	-0.6831	-0.6831	-0.6831	-0.6831	-0.6831	-0.6831	-0.6831	-0.6831	-0.6831	-0.6831	-0.6831	-0.6831
255°	2.8218	1.7405	0.8123	3.2912	3.1729	1.9218	0.9513	1.1912	1.3208	0.4415	-2.0828	-0.9678	-0.5829	-0.3710	-0.2510	-0.1910	-0.1510	-0.1210	-0.1010	-0.0810	-0.0610	-0.0410	-0.0210	-0.0110	0.0010
270°	2.1948	1.7140	1.1329	2.8914	1.9849	2.1170	1.1902	0.6429	0.3199	0.1930	-0.5466	-0.7209	-0.6122	-0.5622	-0.5622	-0.5622	-0.5622	-0.5622	-0.5622	-0.5622	-0.5622	-0.5622	-0.5622	-0.5622	-0.5622
285°	1.9504	1.2406	1.0013	1.8467	1.3491	1.1917	0.7294	0.3514	0.2147	0.2016	-0.7936	-1.1012	-1.1012	-1.1012	-1.1012	-1.1012	-1.1012	-1.1012	-1.1012	-1.1012	-1.1012	-1.1012	-1.1012	-1.1012	-1.1012
300°	1.8278	1.5944	2.5214	2.8214	0.9932	0.1020	0.5810	-1.6021	-1.6021	-0.7930	-4.5314	-2.2248	-0.9825	-0.6952	-0.4980	-0.3656	-0.2956	-0.2656	-0.2556	-0.2556	-0.2556	-0.2556	-0.2556	-0.2556	-0.2556
315°	0.9758	1.6864	1.4931	1.2217	1.1614	1.3114	1.5314	2.3176	3.3432	4.5734	5.9173	7.4845	8.4757	8.9269	9.2469	9.4169	9.4769	9.4969	9.4969	9.4969	9.4969	9.4969	9.4969	9.4969	9.4969
330°	1.0198	1.5838	1.3904	1.4403	0.4403	0.2613	1.4144	1.5118	1.5818	1.6018	1.6118	1.6218	1.6318	1.6418	1.6518	1.6618	1.6718	1.6818	1.6918	1.7018	1.7118	1.7218	1.7318	1.7418	1.7518
345°	1.0588	1.6154	1.2812	1.1812	0.8912	0.6818	1.8218	1.8218	1.8218	1.8218	1.8218	1.8218	1.8218	1.8218	1.8218	1.8218	1.8218	1.8218	1.8218	1.8218	1.8218	1.8218	1.8218	1.8218	1.8218
360°	1.2311	1.1178	1.2107	1.6379	1.7382	1.7147	1.7297	1.7276	1.7107	1.7017	1.7410	1.7410	1.7410	1.7410	1.7410	1.7410	1.7410	1.7410	1.7410	1.7410	1.7410	1.7410	1.7410	1.7410	1.7410
375°	1.7748	0.7858	1.9879	1.4379	1.8479	0.9169	0.6548	0.6748	0.6748	0.6748	0.6748	0.6748	0.6748	0.6748	0.6748	0.6748	0.6748	0.6748	0.6748	0.6748	0.6748	0.6748	0.6748	0.6748	0.6748

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Antenna Pattern of 2.4GHz&5GHz

Appendix C

φ(22.5°)	0.411133	2.18192	0.89034	0.03647	1.311220	3.32414	-4.07438	-4.58946	-4.35412	3.33355	-3.07379	-3.85420	-4.57483	-4.55438	-4.79475	-4.07405	-3.53238	-2.53227	-1.86116	-1.03080	-0.45040	-0.13503	0.151026	0.441004
φ(27°)	0.575014	0.87104	0.89101	0.73058	0.601180	2.889349	-4.27147	-3.62833	-3.13216	-1.78206	-1.87173	-1.51220	-2.68315	-3.93440	-4.86610	-5.71472	-3.86131	-3.18728	-2.72341	-2.42113	-2.17046	-1.12046	0.175110	-1.09112
φ(32°)	0.823168	-0.21640	0.40056	1.36129	0.750338	-1.26068	-3.41313	-3.56183	-1.05018	-1.91687	-1.60168	-1.07163	-1.29130	-1.85296	-4.37621	-6.29344	-4.96141	-3.30924	-3.16972	-4.66414	-3.70269	-2.27048	-4.00053	-3.26349
φ(37.5°)	0.534516	-1.53414	0.78190	2.25136	0.84474	-1.85274	-3.02231	-1.47470	-0.10306	-0.27048	-1.05148	-2.36234	-1.54140	-1.93233	-4.13429	-3.99334	-3.58136	-4.36142	-3.70337	-3.72038	-2.69134	-2.78500	0.739185	-8.64462
φ(42.5°)	0.534516	-1.53414	0.78190	2.25136	0.84474	-1.85274	-3.02231	-1.47470	-0.10306	-0.27048	-1.05148	-2.36234	-1.54140	-1.93233	-4.13429	-3.99334	-3.58136	-4.36142	-3.70337	-3.72038	-2.69134	-2.78500	0.739185	-8.64462
φ(47.5°)	2.67130	-1.49708	-0.86114	1.09101	0.592062	2.05214	-2.59014	-1.53111	0.70117	-3.89040	-6.66447	-3.91321	-3.49338	-4.38741	-5.59440	-6.68410	-4.20355	-6.45828	-4.58148	-4.63661	-4.38432	-2.13238	-2.40126	-4.05236
φ(52.5°)	0.87520	-3.41336	-1.28047	1.11011	0.311220	-1.22180	-1.48625	-3.92227	-2.27271	-3.47416	-5.53719	-7.78126	-6.84235	-3.89058	-5.46923	-6.19227	-4.67338	-3.98429	-3.59129	-4.24525	-2.45235	-2.62028	-3.74131	-4.02030
φ(57.5°)	0.17610	0.38620	0.89050	0.79158	0.893049	-1.28424	-2.96191	-1.28042	0.121079	-3.38572	-5.14351	-3.48334	-5.62621	-5.32618	-6.83842	-8.89472	-4.43856	-6.97765	-4.82044	-3.98418	-2.83030	-1.37011	-0.57077	0.22701
φ(62.5°)	0.61653	0.68129	0.18635	0.79307	1.01168	2.54254	-2.43160	-1.35165	-1.59126	-3.80779	-5.18038	-4.41402	-5.39442	-4.58956	-6.21038	-9.58552	-4.01629	-7.52138	-6.28428	-4.96239	-1.22129	-0.36083	0.63883	0.64011
φ(67.5°)	1.539248	-2.73224	-1.38010	0.28174	2.26204	-1.88149	-1.02138	-2.78448	-4.44032	-1.65130	-3.82035	-6.53311	-7.47420	-4.88977	-6.63674	-4.28654	-1.93973	-4.97623	-3.75128	-3.14032	-1.98175	-0.47415	0.34688	0.34688
φ(72.5°)	1.639236	-2.56919	-1.89136	0.27170	2.07120	-2.86236	-2.18158	-3.67076	-3.30414	-4.42816	-6.20239	-6.66957	-5.59422	-5.59422	-7.22036	-6.58178	-4.89178	-1.82078	-1.68078	-1.93080	-0.78178	-0.20054	0.19119	0.20054
φ(77.5°)	2.48232	-2.59172	-1.89136	0.27170	1.44341	-3.69175	-1.11013	-0.77144	-0.89124	-5.07124	-6.87137	-9.81637	-8.63672	-6.14533	-7.94221	-5.91411	-4.47135	-6.16932	-1.82712	-1.38680	-0.66312	-0.45212	-1.54180	0.20054
φ(82.5°)	6.72147	-5.71454	-4.09423	-3.57142	5.18840	-2.44101	0.28002	-1.25924	-1.68114	-3.72181	-1.25903	-3.86973	-1.21135	-3.51449	-4.01130	-10.80120	-10.89110	-10.19589	-9.54438	-8.39140	-6.30140	-4.74816	-5.95551	0.20054
φ(87.5°)	4.82614	-4.57268	-4.19038	-4.20441	4.52916	-1.99612	1.69212	-2.24158	1.68250	-4.13614	-2.19466	-3.42330	-1.52103	-2.54536	-3.12749	-11.63108	-10.48109	-9.46739	-8.72149	-6.90431	-5.13140	-3.61948	-4.72312	0.20054
φ(92.5°)	4.82614	-4.57268	-4.19038	-4.20441	4.52916	-1.99612	1.69212	-2.24158	1.68250	-4.13614	-2.19466	-3.42330	-1.52103	-2.54536	-3.12749	-11.63108	-10.48109	-9.46739	-8.72149	-6.90431	-5.13140	-3.61948	-4.72312	0.20054
φ(97.5°)	1.943108	-1.974161	-1.484109	-1.159046	-0.735611	-3.93426	-4.19337	-3.51120	-1.02054	-2.66048	-1.95014	-2.26029	-3.40437	-4.95617	-6.96127	-13.98128	-10.29122	-11.75109	-14.08142	-11.69128	-10.13711	-7.196145	-5.801378	-1.076498
φ(102.5°)	-0.424108	-10.251458	-15.704289	-9.901518	3.843320	-2.90075	-2.84929	-2.70128	-3.22376	-5.95140	-4.87523	-4.76508	-6.85051	-4.13676	-7.33854	-11.02133	-11.02133	-11.50144	-11.76139	-11.17184	-10.76021	-11.33146	-10.76420	-7.92810
φ(107.5°)	-1.778488	-6.93348	-8.14801	-7.91750	6.59442	-3.50227	-1.21701	-2.30036	-4.11337	-3.57314	-4.19480	-7.80648	-6.28416	-6.01622	-8.32139	-15.02148	-13.031469	-15.31157	-14.00147	-14.70147	-15.49133	-14.64147	-13.52111	-8.89146
φ(112.5°)	-5.18576	-5.91807	-5.68166	-5.65664	6.50416	-4.24344	-3.17031	-3.37430	-3.23628	-3.93649	-6.62107	-13.50153	-14.15128	-11.80199	-13.66191	-11.50174	-13.86193	-13.95128	-13.66191	-11.60685	-11.14467	-11.06685	-11.14467	-9.89146
φ(117.5°)	-6.69050	-5.27151	-5.52410	-5.69758	6.87042	-6.88679	-5.67051	-5.07155	-6.40758	-6.31788	-9.40715	-15.56166	-16.41734	-14.78135	-13.26127	-12.73132	-11.68143	-13.99151	-12.22111	-12.63142	-10.21814	-8.05142	-6.53408	0.20054
φ(122.5°)	-11.151168	-10.82103	-10.36988	-10.90993	8.831127	-10.11867	-8.91102	-10.31104	-8.74127	-9.47181	-12.69116	-25.09111	-26.09119	-24.97104	-22.11182	-22.11182	-22.11182	-22.11182	-22.11182	-22.11182	-22.11182	-22.11182	-22.11182	-22.11182
φ(127.5°)	2.450394	Table 2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
φ(132.5°)	φ(130°)	2.80214	2.26214	1.45023	2.70530	-6.63089	-6.88084	-5.36051	-4.48048	-4.69048	-4.72042	-4.79048	-1.53146	-1.42148	-1.48135	-1.48141	-1.29048	-0.82048	-0.93048	-0.81341	-0.63048	-0.44048	-0.36048	-0.36048
φ(137.5°)	φ(135°)	4.228465	3.67048	4.50226	4.70748	5.27013	7.26017	5.42828	5.87619	5.80012	2.10208	1.79165	-1.33927	-1.19114	-0.88688	-0.86039	0.31029	3.86078	3.21031	3.11169	3.10322	3.04238	3.04238	
φ(142.5°)	φ(140°)	4.98158	-4.98158	6.50318	8.89750	4.84849	9.28716	7.07478	7.86715	8.11078	4.30143	-4.04354	3.93310	1.61018	0.62038	0.29331	0.29331	0.19038	0.00038	0.47078	0.88053	3.28378	4.22140	6.68034
φ(147.5°)	φ(145°)	6.37671	-7.19427	-10.32040	-11.11318	-11.26100	-10.08032	-8.86745	-8.38580	-5.04141	-3.94342	-3.29200	-1.70122	-0.83243	0.11038	0.41042	0.26015	0.14828	0.18288	0.29030	-3.82030	-3.44030	-4.47523	-5.78929
φ(152.5°)	φ(150°)	8.31954	-9.80937	-14.37624	-10.18101	-12.32120	-11.50478	-9.78733	-9.26732	-6.20147	-4.87102	-3.30737	-2.09127	-0.18850	0.50038	0.61042	0.60045	0.29514	0.12400	0.21022	-0.29038	-0.52140	-0.44742	-5.17954
φ(157.5°)	φ(155°)	3.618358	-4.62656	-5.64636	8.27014	-12.02103	-12.45116	-11.23033	-10.46048	-6.64758	-6.17018	-3.98627	-2.71148	-1.47014	0.71044	0.36054	0.46037	0.53048	0.40034	0.31027	-0.33042	-3.94444	-3.76048	-2.86048
φ(162.5°)	φ(160°)	4.230245	-1.98217	-3.16031	-4.47050	6.384320	-7.98848	-7.65763	-7.54763	-8.54623	-4.58032	-3.29123	-2.05142	0.23090	0.41376	2.36024	1.93144	0.93058	0.22008	-0.38011	-0.77028	0.08018	0.36018	-1.14144
φ(167.5°)	φ(165°)	2.151179	-1.133116	-1.02048	-1.68423	-4.19845	-6.34825	-5.81053	-6.78016	-6.42937	-1.95089	-1.17164	-2.21228	-1.63081	0.17800	1.70221	2.03233	1.79091	0.49035	-0.44047	-0.82048	0.20048	-2.38144	-1.75180
φ(172.5°)	φ(170°)	3.603308	-3.89007	-0.97084	-0.11614	-1.19252	-2.65867	-5.74617	-5.44546	-7.13843	-6.28128	-3.21467	-2.77926	-1.73672	0.12038	1.01202	2.09123	2.09123	1.14032	0.69020	1.66042	2.03022	-1.73184	-2.64038
φ(177.5°)	φ(175°)	5.176163	-5.93613	-5.54146	-5.49630	6.81178	-5.65025	-1.44100	-1.80045	-4.86145	-3.48118	-1.68926	-0.46263	-0.56167	-1.61028	1.76030	3.97426	3.88015	1.20016	1.19910	2.96085	4.33081	0.22041	-1.27012
φ(182.5°)	φ(180°)	6.70611	-6.80123	-4.90401	-4.00243	-4.80448	-4.30434	-3.84028	-3.34048	-5.87169	-6.58158	-4.86158	-2.84264	-1.61131	0.69128	2.96012	3.63085	3.65114	1.61131	0.69128	2.71081	2.95081	0.86018	-4.23014
φ(187.5°)	φ(185°)	6.28620	-4.98143	-5.08167	-5.63055	5.10359	-4.23934	-2.91020	-1.97020	-4.61179	-7.44681	-5.93479	-6.54622	-5.77442	-2.83109	-1.65085	2.95044	3.98088	3.12027	1.25103	0.78024	-2.95041	-3.80048	-4.63048
φ(192.5°)	φ(190°)	6.796577	-4.83132	-2.69143	-3.34929	3.89128	-3.28240	-1.54025	-2.35144	-3.42161	-4.84149	-3.77046	-6.75856	-6.14468	-3.44948	-0.77026	2.10249	3.20012	2.59164	0.83008	-0.32052	-1.20041	-1.67112	-5.68116
φ(197.5°)	φ(195°)	5.83561	-5.54425	-3.22032	-2.89138	3.82052	-6.80535	-3.94131	-2.89525	-2.38139	-4.40043	-8.72734	-6.73407	-6.26128	-1.14078	2.98295	3.25038	2.46092	0.98072	-0.25035	0.00060	0.50041	-3.31047	-5.28048
φ(202.5°)	φ(200°)	5.759158	-6.09040	-5.74442	-4.69334	3.41441	-4.10047	-2.66073	-0.60761	4.80171	-4.87158	-1.17812	-2.12211	-1.69718	-0.87134	-1.04098	2.89168	1.89168	1.03051	-1.54019	-1.18013	1.06040	1.99018	-1.02038
φ(207.5°)	φ(205°)	4.800147	-4.29410	-3.60023	-2.67194	4.27190	-2.72198	-1.61026	-0.26019	6.91036	-4.93046	-6.62691	-8.13645	-6.90658	-3.38130	-0.51079	2.96085	2.96085	0.90089	-0.25129	0.04014	1.86023	-5.44016	-6.27048
φ(212.5°)	φ(210°)	6.26656	-5.98613	-4.68344	-4.68048	4.84438	-5.74334	-2.47024	-4.44860	6.69044	-4.28061	-6.51047	-7.29073	-6.15067	-3.13031	0.91045	0.69032	0.32078	0.30055	-0.98032	-0.28018	-0.28018	-2.16018	-6.42048
φ(217.5°)	φ(215°)	2.36170	-1.24210	-2.44133	-2.03148	0.86803	-6.78448	-3.78464	-6.79489	-7.76580	-2.87038	-4.41687	-3.98428	-2.50272	-2.28430	-3.40222	-0.78027	0.41044	1.33089	-2.11048	0.78016	2.68044	1.33048	-2.16048
φ(222.5°)	φ(220°)	6.660307	-3.66030	-3.71038																				

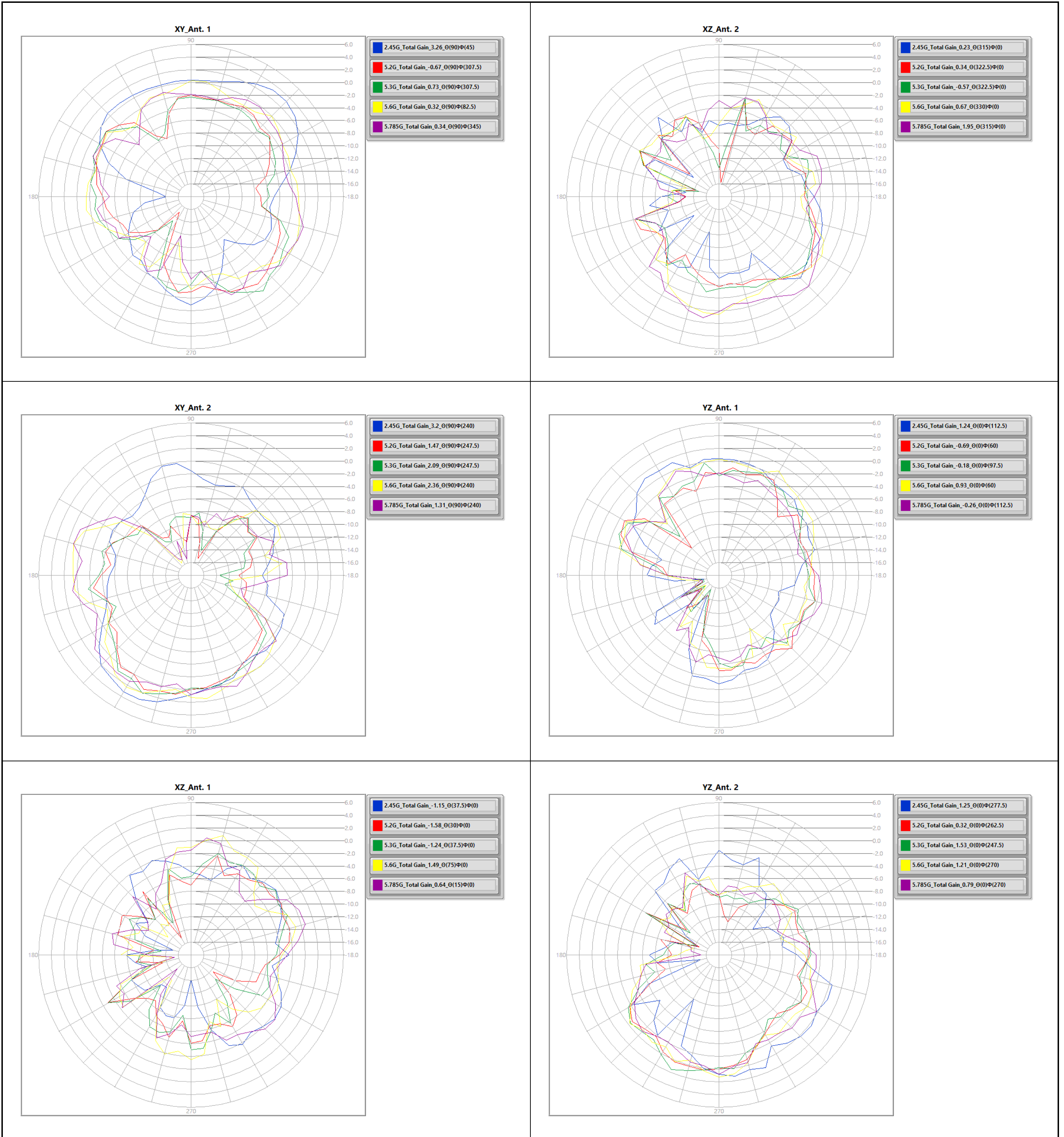


Antenna Pattern of 2.4GHz&5GHz

Appendix C

(f)(2) (f)(8)(2) (f)(15) (f)(17) (f)(17)(2) (f)(17)(3) (f)(18) (f)(18)(2) (f)(18)(3) (f)(18)(4) (f)(18)(5) (f)(18)(6) (f)(18)(7) (f)(18)(8) (f)(18)(9) (f)(18)(10) (f)(18)(11) (f)(18)(12) (f)(18)(13) (f)(18)(14) (f)(18)(15) (f)(18)(16) (f)(18)(17) (f)(18)(18) (f)(18)(19) (f)(18)(20) (f)(18)(21) (f)(18)(22) (f)(18)(23) (f)(18)(24) (f)(18)(25) (f)(18)(26) (f)(18)(27) (f)(18)(28) (f)(18)(29) (f)(18)(30) (f)(18)(31) (f)(18)(32) (f)(18)(33) (f)(18)(34) (f)(18)(35) (f)(18)(36) (f)(18)(37) (f)(18)(38) (f)(18)(39) (f)(18)(40) (f)(18)(41) (f)(18)(42) (f)(18)(43) (f)(18)(44) (f)(18)(45) (f)(18)(46) (f)(18)(47) (f)(18)(48) (f)(18)(49) (f)(18)(50) (f)(18)(51) (f)(18)(52) (f)(18)(53) (f)(18)(54) (f)(18)(55) (f)(18)(56) (f)(18)(57) (f)(18)(58) (f)(18)(59) (f)(18)(60)	3.094470 3.396435 6.460364 8.246220 8.611237 4.191229 5.671417 5.259338 4.856811 4.602894 3.526328 5.460460 12.751388 15.111568 10.471158 10.901121 5.785684 3.007907	3.064470 5.001231 6.094274 8.324474 2.261138 1.704658 4.201425 3.521912 3.861938 11.521558 5.147194 7.891937 10.311198 15.111568 12.991222 10.701302 5.785684 3.007907	-4.361476 -2.242731 -2.271310 -2.341486 0.631319 -0.661725 -4.691634 5.721036 -9.461765 -11.521558 -9.791937 -10.311198 -14.141166 -14.141166 -12.711269 -14.341421 -4.171456	-4.791638 2.901731 -3.501753 -3.681787 8.561883 6.961136 9.961799 10.221700 -10.041676 8.141748 8.001513 8.001513 10.221943 10.041656 13.571410 -14.261388 -13.851268	-5.836229 8.221759 8.221759 9.361264 8.201648 4.241555 6.011674 8.591682 7.521632 3.371479 2.971249 8.361749 10.031132 8.991634 -14.001364 -14.511259	-7.421633 -7.911765 -8.491619 -12.991368 -12.991368 -13.261327 -10.591268 -7.491648 7.521632 -8.321721 -7.101826 -7.841889 -13.891554 -10.851163 -10.851163 -11.671139	-11.681327 -11.031425 -13.261327 -10.591268 -13.261327 -10.591268 -13.261327 -7.491648 -14.031468 -10.951453 14.661594 9.591268 16.081503 12.861214 -11.851125	-13.119173 -13.501257 -13.501257 -11.351435 -12.051268 4.781245 -5.591386 -5.591386 -8.431314 -8.321721 -11.281321 -14.881328 -10.211873 -13.181163 -10.521105	-7.381633 -1.171300 -1.261265 -1.471033 -1.121109 1.211196 2.001110 2.481599 -0.471028 0.361049 -0.421141 -2.611271 -1.851208 1.541446 -2.761233	-1.171300 0.381078 0.771024 1.221671 1.071321 -1.871024 0.781161 -1.511268 -0.221671 -1.261265 -1.471033 -1.121109 1.211196 2.001110 2.481599 -0.471028 0.361049 -0.421141 -2.611271 -1.851208 1.541446 -2.761233	1.121109 0.191106 -1.391379 -1.131273 -1.211507 -1.181044 2.011244 0.831103 2.451108 0.841000 -1.781121 -1.411354 7.261124 -11.531159 8.451101	1.211196 0.500699 0.952208 3.312323 0.940334 0.901102 -0.431123 -1.141091 0.201110 2.501446 -0.401233 -0.431123 1.411354 7.261124 -11.531159 8.451101	2.001110 0.560268 -0.561070 2.922205 0.840111 1.211507 0.714221 -0.131028 0.201110 2.501446 -0.401233 -0.431123 1.411354 7.261124 -11.531159 8.451101	2.481599 0.420449 1.511268 2.451108 0.841000 -1.781121 -1.411354 7.261124 -11.531159 8.451101 -1.851208 1.541446 -2.761233	-0.471028 0.420449 0.361042 -1.811636 2.391462 8.931109 -13.441330 -6.341236 -2.921268 -0.431123 -1.141354 7.261124 -11.531159 8.451101	0.361042 0.420449 0.361042 -1.811636 2.391462 8.931109 -13.441330 -6.341236 -2.921268 -0.431123 -1.141354 7.261124 -11.531159 8.451101	1.811636 2.391462 8.931109 -13.441330 -6.341236 -2.921268 -0.431123 -1.141354 7.261124 -11.531159 8.451101	8.931109 -13.441330 -6.341236 -2.921268 -0.431123 -1.141354 7.261124 -11.531159 8.451101	-13.441330 -6.341236 -2.921268 -0.431123 -1.141354 7.261124 -11.531159 8.451101	-6.341236 -2.921268 -0.431123 -1.141354 7.261124 -11.531159 8.451101	-2.921268 -0.431123 -1.141354 7.261124 -11.531159 8.451101	-0.431123 -1.141354 7.261124 -11.531159 8.451101	1.141354 7.261124 -11.531159 8.451101	7.261124 -11.531159 8.451101	-11.531159 8.451101	8.451101
(f)(19)	-3.002773	-2.781256	-3.121298	-3.291255	-2.701272	-2.101241	-2.691263	-2.941278	-2.991323	-3.081304	-2.831254	-2.521268	-2.871258	-3.061306	-3.271297	-3.001310	-3.161306	-3.631293	-3.391329	-4.081376	-3.991400	-3.891459	-4.881457	-4.651470		
(f)(20)	-1.751207	-2.691273	-3.561330	-3.101419	-4.081396	-4.071389	-4.541495	-4.651501	-4.671491	-4.851496	-4.921449	-4.641433	-4.101434	-4.191465	-3.641433	-3.831298	-2.891288	-3.241318	-2.501383	-1.501183	-1.811199	-1.961185	-1.941202	-2.001213		
(f)(21)	-1.311184	-1.171205	-3.891382	-4.291428	-5.591576	-6.221600	-6.021618	-7.741724	-6.611641	-6.741566	-6.181479	-3.601335	-2.991315	-3.071188	-3.191313	-3.031284	-3.011327	-3.201355	-3.111397	-2.911244	-2.291184	-1.291158	-1.161159	-1.351131		
(f)(22)	-1.261174	-1.991250	-2.491289	-2.801198	-3.211364	-5.881634	-6.011675	-5.231671	-6.761579	-6.391480	-3.611234	-1.261011	-0.841178	-2.591330	-3.991329	-2.801299	-3.431314	-3.141233	-1.941171	-1.491168	-1.741169	-1.101236	-2.231237	-2.491179		
(f)(23)	-3.311330	-4.461442	-5.231468	-4.141350	-3.841387	-4.861541	-4.831442	-7.381632	-5.501421	-3.611271	-1.571100	-0.411027	0.211448	-1.241113	-0.801079	-0.841095	-2.301229	-1.141047	-0.921045	-2.031170	-1.821212	-1.141244	-3.361303			
(f)(24)	-3.781288	-2.791340	-5.391490	-3.191263	-2.431230	-3.101411	-6.361731	-7.501611	-4.961314	-2.151141	-1.091031	0.01090	0.870931	1.021119	0.810165	0.931452	-0.301092	-1.571214	-1.861047	-0.161061	-0.751047	-0.531068	-1.071203	-3.271377		
(f)(25)	-4.361270	-1.711254	-4.171456	-5.131637	-6.851281	-2.851401	-5.941719	-8.961599	-6.031354	-2.341161	-1.391058	0.221011	1.951254	2.811279	1.811222	0.311121	-2.421323	-2.871200	-1.661162	-1.801165	-1.701144	-1.271141	-1.861275	-3.651488		
(f)(26)	-5.341617	-4.951634	-7.191484	-8.031662	-4.571251	-2.861455	-6.791668	-8.081657	-8.691488	-3.021439	-4.211319	-0.820211	1.452192	3.871054	2.411171	-1.111207	-3.431381	-3.151326	-2.491223	-2.101215	-2.301238	-2.531293	-2.621295	-3.271437		
(f)(27)	-3.281911	-4.911671	-8.501843	-11.931879	-4.751233	-1.591430	-6.701961	-7.451732	-6.861421	-6.021639	-7.711514	-1.841099	-0.192161	3.911830	3.342158	1.781207	-1.711291	-4.701300	-2.991213	-3.201232	-3.201270	-2.981242	-1.381109	-1.561235		
(f)(28)	-1.801155	-2.181211	-6.591706	-7.811862	-6.521366	-2.751400	-7.751218	-11.021265	-12.181447	-5.471420	-2.921439	-0.492127	3.201236	2.891824	2.440176	0.751164	-4.031377	-3.881413	-1.891136	-1.891136	-1.981158	-1.581158	-2.201194			
(f)(29)	-1.831328	-4.411608	-8.751732	-4.291430	-6.331515	-3.291482	-7.031088	-11.691866	-9.941132	-6.331440	-3.861217	-1.541069	-0.591183	2.961244	1.732121	2.261244	-1.101148	-4.491215	0.181010	-0.901110	-0.871094	-0.291300	-2.621154			
(f)(30)	-3.861482	-5.761449	-6.431530	-3.591407	-6.431562	-6.611588	-7.051130	-15.001140	-13.811481	-8.991236	-1.741036	-0.371211	-1.021136	1.531000	0.172191	1.200184	-1.801056	-1.041098	-0.291018	-0.341015	-0.321114	-1.151010	-2.051465	-5.261601		
(f)(31)	-2.861278	-5.231397	-5.691622	-4.291619	-8.091743	-6.881877	-4.591256	-15.341217	-15.161468	-7.581932	-1.170930	1.161087	0.110181	-0.461202	-0.771111	1.041219	1.310167	0.150186	0.351167	-1.701109	-4.511955	-6.881474				
(f)(32)	-4.341527	-7.191296	-2.671400	-6.991648	-8.091101	-12.001807	-7.751192	-14.861108	-15.701258	-5.891103	0.631174	1.811023	1.271127	0.211147	-0.331101	-0.710466	-0.620863	0.491090	0.401056	0.691140	-0.611266	-3.921345	-10.971127	-10.401735		
(f)(33)	-7.041311	-3.071083	-0.301382	-6.891912	-15.261343	-6.7411023	-11.881672	-11.361121	-6.971629	0.631174	2.340197	0.551646	-0.061000	-2.611129	-1.481335	-3.441123	0.671140	0.511046	-1.841100	-2.151476	-10.751040	8.801311	-11.241157			
(f)(34)	-5.561388	-4.191171	-3.401071	-15.711971	-7.511764	-7.991744	-4.001568	-7.171804	-11.831925	-5.731032	-1.910189	1.250153	0.761179	-2.591486	-5.381448	-2.921364	-1.561261	-1.771181	-1.511166	-3.881167	-2.201497	-4.991457	-6.221932	-10.081372		
(f)(35)	-7.651816	-9.341787	-7.291014	-6.711626	-7.671871	-6.971705	-6.791646	-6.741600	-12.181027	-5.381493	-3.251108	0.761079	0.951230	-8.191810	6.011392	2.451284	3.171415	-3.261492	-2.111153	-4.611443	-2.281551	-12.781827	-8.891592	-5.381107		
(f)(36)	-7.111880	-5.211202	-7.231259	-14.491233	-12.671183	-9.121023	-8.601624	-6.191838	-8.171894	-7.961634	-3.891371	-3.411222	-2.841462	-6.031298	9.751680	5.961266	6.571434	-4.671241	-1.501150	2.931422	-3.281749	-7.481440	-3.501177	-6.801573		
(f)(37)	-5.221032	-5.9611310	-8.281183	-15.491423	-11.411808	-5.261651	-7.791479	-8.301522	-15.521028	-9.711780	-5.961426	-3.191347	-2.491389	-8.521835	8.711810	6.671564	7.031441	-7.051699	-0.981043	-1.881118	-1.481385	-4.481279	-3.301424	-4.421137		
(f)(38)	-6.371819	-11.191488	-11.2811933	-12.511015	-8.601034	-4.861612	-7.591771	-9.651157	-10.771778	-7.691130	-7.051679	-8.131807	-7.041883	-12.241819	-6.541494	-5.191511	-4.851585	-13.451877	-1.991002	-0.421042	-1.991316	-3.971610	-9.981541	-5.541495		
(f)(39)	-6.181674	-7.271991	-10.381632	-9.691621	-4.121362	-4.271536	-8.991281	-15.311959	-7.551906	-9.191103	-12.351119	-12.161043	-7.991715	-7.991692	9.231971	8.621695	7.341094	-12.441638	-2.971511	-0.891136	-3.091373	-4.171445	-6.211724	-5.151676		
(f)(40)	-5.521568	-6.561719	-6.991808	-10.421082	-8.891662	-8.961634	-8.891675	-11.251138	-13.461109	-10.421082	-11.081127	-11.171444	-7.211632	-6.531778	-6.341010	-10.791195	-13.421018	-12.741113	-2.291389	-3.161032	-5.361612	-6.671601	-5.261570	-5.991443		
(f)(41)	-7.861807	-10.711326	-14.291197	-12.251120	-13.451156	-12.581197	-13.011589	-14.291475	-13.041246	-11.151937	-4.591451	-5.011475	-4.361617	-6.411663	-10.881134	-15.261529	-16.931162	-10.221700	-5.261523	-5.981644	-7.011827	-8.231786	-7.811871	-8.991666		
(f)(42)	-8.601915	-10.601229	-12.971132	-12.511371	-13.891432	-13.461448	-13.571134	-14.2811340	-14.991485	-14.511513	-15.991130	-13.211300	-11.541198	-11.991288	-13.411339	-13.181124	-12.981122	-9.481810	-6.401693	-5.451685	-6.671811	-8.641099	-12.871082	-10.261851		
(f)(43)	-12.791332	-13.661398	-14.791533	-15.541449	-15.101531	-14.971490	-15.191492	-13.091332	-12.241313	-13.351466	-12.911347	-13.131345	-13.401347	-12.261183	-12.281388											

E1(XY plane) – $\Theta(90)\Phi(0-360)$
 E2(XZ plane) – $\Theta(0-180)\Phi(0)$ and $\Theta(0-180)\Phi(180)$
 E3(YZ plane) – $\Theta(0-180)\Phi(90)$ and $\Theta(0-180)\Phi(270)$





Antenna Pattern of 6GHz

Appendix D

Table with multiple columns containing numerical data for antenna patterns at 6GHz, including elevation and azimuth coordinates and corresponding signal strength values.

E1(XY plane) – $\Theta(90)\Phi(0-360)$
 E2(XZ plane) – $\Theta(0-180)\Phi(0)$ and $\Theta(0-180)\Phi(180)$
 E3(YZ plane) – $\Theta(0-180)\Phi(90)$ and $\Theta(0-180)\Phi(270)$

