



Antenna Composite Gain Test Report

Equipment	AX5700 WiFi6 Gigabit Ethernet Gateway
Brand Name	ZYXEL, Google Fiber
Model Name	EX3510-B1, C3510XZ, GRAX110Z
Applicant	Zyxel Communications Corporation No.2 Industry East RD. IX, Hsinchu Science Park, Hsinchu 30075, Taiwan
Manufacturer	Zyxel Communications Corporation No.2 Industry East RD. IX, Hsinchu Science Park, Hsinchu 30075, Taiwan
Sample Received	May 23, 2022
Start Test Date	May 30, 2022
Final Test Date	May 30, 2022



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History of this test report

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1. Operation Mode and Antenna Information

Ant. No. (Define by manufacturer)	Antenna Position	RF Port	Brand Name	Model Name	Ant. Type	Connector	Modes of Operation
2.4G-Ant.0	2G Ant1	1	WHAYU	65-034-000142B	PCB	none (like solder)	2.4GHz
2.4G-Ant.1	2G Ant2	2	WHAYU	65-034-000192B	PCB	none (like solder)	2.4GHz
2.4G-Ant.2	2G Ant3	3	WHAYU	65-034-000141B	PCB	none (like solder)	2.4GHz
5G-Ant.0	5G Ant1	1	WHAYU	65-034-000147B	PCB	I-PEX	5GHz UNII 1~3
5G-Ant.1	5G Ant2	2	WHAYU	65-034-000195B	PCB	I-PEX	5GHz UNII 1~3
5G-Ant.2	5G Ant3	3	WHAYU	65-034-000194B	PCB	I-PEX	5GHz UNII 1~3
5G-Ant.3	5G Ant4	4	WHAYU	65-034-000193B	PCB	I-PEX	5GHz UNII 1~3

Note:

2.4GHz (3TX/3RX)

2G Ant1~3 can be used as transmitting/receiving antenna.

2G Ant1~3 could transmit/receive simultaneously.

5GHz Operation Mode (4TX/4RX)

5G Ant1~4 can be used as transmitting/receiving antenna.

5G Ant1~4 could transmit/receive simultaneously.

1.1.1 Table for Multiple Listing

The brand/model names in the following table are all refer to the identical product.

Brand Name	Model Name	Description
ZYXEL	EX3510-B1, C3510XZ	All the models are identical, the difference model for difference brand served as marketing strategy.
Google Fiber	GRAX110Z	

Note 1: From the above models, model: EX3510-B1 was selected as representative model for the test and its data was recorded in this report.

Note 2: The above information was declared by manufacturer.

2. Test Frequency

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

Band [MHz]	Test Frequency [MHz]
2400-2483.5	2400
	2450
	2483.5
5150-5250	5200
5250-5350	5300
5470-5725	5600
5725-5850	5785

3. Testing Location

Testing Location		
☒	HWA YA	ADD : No.13-1 & 14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333, Taiwan R.O.C.

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
Radiated	05CH03-HY	Rex Liao	21-22 / 50-55	May 30, 2022

Note:

Testing Site Information

Brand Name: TDK

Dimension: 11m*6m*6m

Characteristic: Fully Anechoic Chamber

4. Test Facility and Configuration

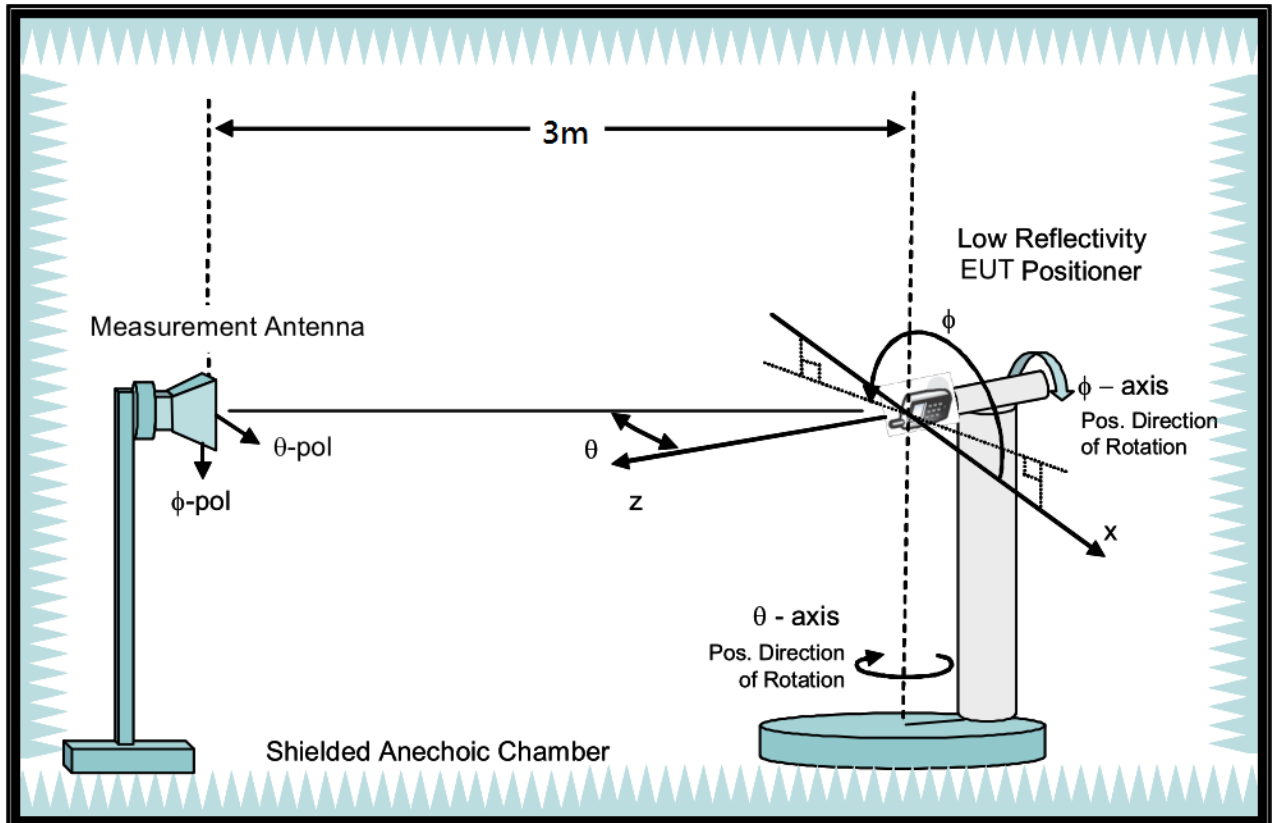
Test configuration: Reference to CITA OTA distributed-axes system configuration.

Chamber: Fully Anechoic Chamber.

Measurement antenna: Dual Polarization Horn antenna

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

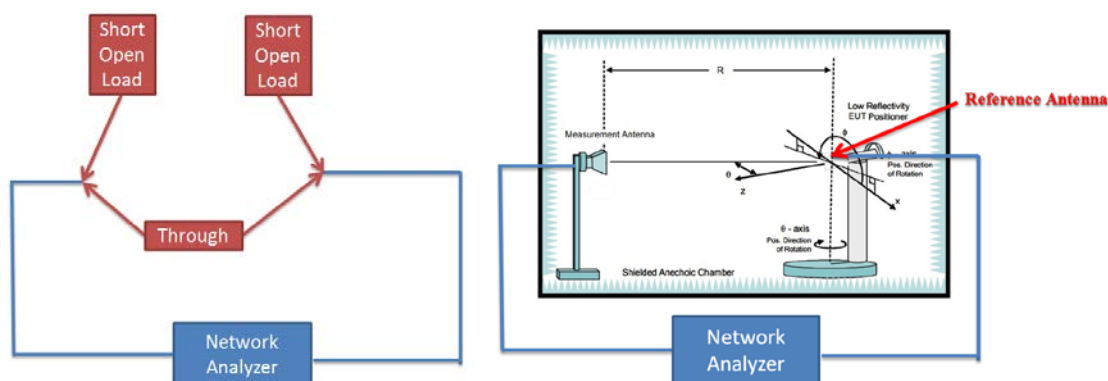
#Reference to CTIA "ctia-test-plan-for-wireless-device-over-the-air-performance-ver-3-7-1"



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	7500
G reading (dB)	-31.4	-31.4	-31.3	-31.3	-31	-30.7	-30.1	-30.5	-30.5	-30.8	-31.3	-32.8	-34.4	-35.4
Reference gain (dBi)	10.2	10.4	10.6	12.4	12.8	13.4	13.4	13.3	13.3	13.1	13.2	12.3	11.7	11.1
Factor (dB)	41.34	41.55	41.68	43.24	43.56	43.68	43.79	43.91	43.99	44.43	44.49	45.24	46.12	46.31

Note:

$G \text{ reading (dB)} = 20 \cdot \log(V_2/V_1) = 10 \cdot \log(P_2/P_1)$

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.

Factor = gain factor + power gain conversion= (Reference antenna gain)-(G 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 10 degree from 0 to 350 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)	2.4G	2.45G	2.4835G
Ant. 1 (dBi)	3.55	2.18	2.16
Ant. 2 (dBi)	-12.84	-15.1	-14.63
Ant. 3 (dBi)	2.55	1.82	0.06
DG [1SS] (dBi)	4.98	3.84	3.1
Polarization	Theta	Theta	Theta
Θ (°)	90	90	90
Φ (°)	80	70	80

Frequency (Hz)	5.2G	5.3G	5.6G	5.785G
Ant. 1 (dBi)	1.33	3.42	2.47	2.73
Ant. 2 (dBi)	-12.03	-11.94	-8.06	-12.23
Ant. 3 (dBi)	0.38	3.86	-0.24	-0.08
Ant. 4 (dBi)	2.57	-0.51	0.61	2.68
DG [1SS] (dBi)	5.59	6.52	5.51	5.95
Polarization	Theta	Theta	Theta	Theta
Θ (°)	80	130	90	100
Φ (°)	50	250	100	90

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)	2.4G	2.45G	2.4835G
Ant. 1 [$10^{(G/20)}$]	$10^{(3.55/20)}$	$10^{(2.18/20)}$	$10^{(2.16/20)}$
Ant. 2 [$10^{(G/20)}$]	$10^{(-12.84/20)}$	$10^{(-15.1/20)}$	$10^{(-14.63/20)}$
Ant. 3 [$10^{(G/20)}$]	$10^{(2.55/20)}$	$10^{(1.82/20)}$	$10^{(0.06/20)}$
Ant. 1 [$10^{(G/20)}$] value	1.505	1.285	1.282
Ant. 2 [$10^{(G/20)}$] value	0.228	0.176	0.186
Ant. 3 [$10^{(G/20)}$] value	1.341	1.233	1.007
Sum All Antenna [Amax]	3.074	2.694	2.475
DG [$10 \cdot \log(A_{max}^2/N_{ant})$]	4.98	3.84	3.1

Frequency (Hz)	5.2G	5.3G	5.6G	5.785G
Ant. 1 [$10^{(G/20)}$]	$10^{(1.33/20)}$	$10^{(3.42/20)}$	$10^{(2.47/20)}$	$10^{(2.73/20)}$
Ant. 2 [$10^{(G/20)}$]	$10^{(-12.03/20)}$	$10^{(-11.94/20)}$	$10^{(-8.06/20)}$	$10^{(-12.23/20)}$
Ant. 3 [$10^{(G/20)}$]	$10^{(0.38/20)}$	$10^{(3.86/20)}$	$10^{(-0.24/20)}$	$10^{(-0.08/20)}$
Ant. 4 [$10^{(G/20)}$]	$10^{(2.57/20)}$	$10^{(-0.51/20)}$	$10^{(0.61/20)}$	$10^{(2.68/20)}$
Ant. 1 [$10^{(G/20)}$] value	1.165	1.483	1.329	1.369
Ant. 2 [$10^{(G/20)}$] value	0.25	0.253	0.395	0.245
Ant. 3 [$10^{(G/20)}$] value	1.045	1.56	0.973	0.991
Ant. 4 [$10^{(G/20)}$] value	1.344	0.943	1.073	1.361
Sum All Antenna [Amax]	3.805	4.238	3.77	3.966
DG [$10 \cdot \log(A_{max}^2/N_{ant})$]	5.59	6.52	5.51	5.95

Note:

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

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

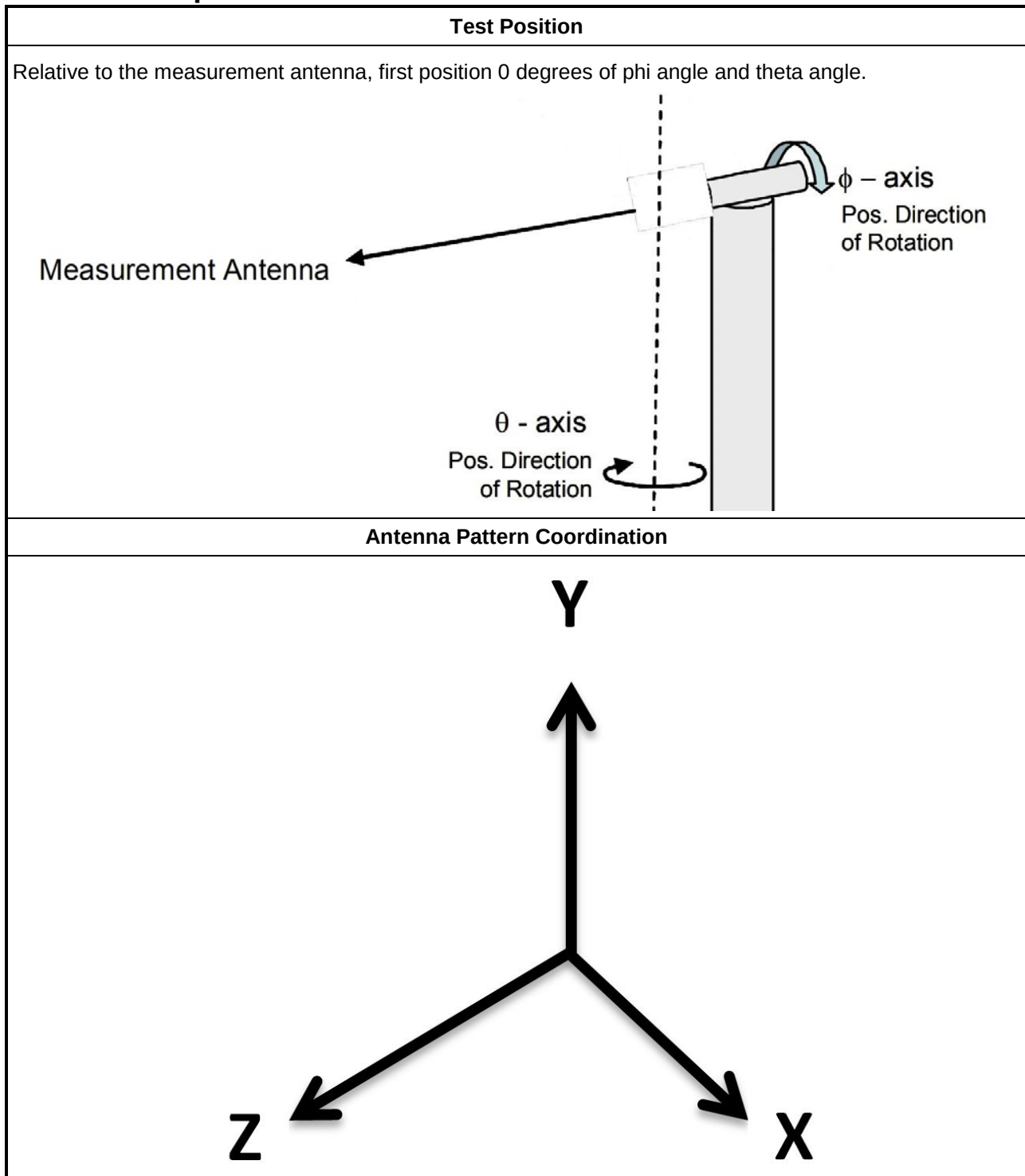
Freq(Hz)	2.4G	2.45G	2.4835G
Ant. 1 Max Gain (dBi)	3.64	2.8	2.47
Ant. 2 Max Gain (dBi)	3.62	3.76	3.35
Ant. 3 Max Gain (dBi)	3.36	2.81	1.51
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/90/70	Theta/90/80	Theta/80/90
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Phi/80/250	Phi/80/260	Phi/80/260
Ant. 3 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/100/80	Theta/100/80	Theta/100/80
Max Gain (dBi)	3.64	3.76	3.35
DG [1SS] (dBi)	4.98	3.84	3.1
DG [2SS] (dBi)	3.64	3.76	3.35
DG [3SS] (dBi)	3.64	3.76	3.35

Freq(Hz)	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	2.22	3.42	2.47	2.73
Ant. 2 Max Gain (dBi)	4.22	4.47	4.36	5.32
Ant. 3 Max Gain (dBi)	3.92	4.11	3.74	3.49
Ant. 4 Max Gain (dBi)	3.19	3.6	2.62	3.62
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/80/60	Theta/130/250	Theta/90/100	Theta/100/90
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Phi/130/290	Phi/140/260	Phi/140/260	Phi/140/260
Ant. 3 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/110/250	Theta/110/250	Theta/130/250	Theta/130/250
Ant. 4 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/130/80	Theta/110/60	Theta/70/280	Theta/120/80
Max Gain (dBi)	4.22	4.47	4.36	5.32
DG [1SS] (dBi)	5.59	6.52	5.51	5.95
DG [2SS] (dBi)	4.22	4.47	4.36	5.32
DG [4SS] (dBi)	4.22	4.47	4.36	5.32

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 (3SS) = Directional Gain (1SS) – 4.77dB. If directional gain is less than max gain, use max gain as directional gain.
5. 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-1292	1GHz~18GHz	Aug. 04, 2021	Aug. 03, 2022
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	V1.0.6	-	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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Freq(Hz)	2.4G	2.45G	2.4835G
Ant. 1 Max Gain (dBi)	3.64	2.8	2.47
Ant. 2 Max Gain (dBi)	3.62	3.76	3.35
Ant. 3 Max Gain (dBi)	3.36	2.81	1.51
Ant. 1 Polarization/Θ(°)/Φ(°)	Theta/90/70	Theta/90/80	Theta/80/90
Ant. 2 Polarization/Θ(°)/Φ(°)	Phi/80/250	Phi/80/260	Phi/80/260
Ant. 3 Polarization/Θ(°)/Φ(°)	Theta/100/80	Theta/100/80	Theta/100/80
Max Gain (dBi)	3.64	3.76	3.35
DG [1SS] (dBi)	4.98	3.84	3.1
DG [2SS] (dBi)	3.64	3.76	3.35
DG [3SS] (dBi)	3.64	3.76	3.35



Radiated Composite Gain Data of 2.4GHz

Appendix A

DG 1SS Result

Freq(Hz)	2.4GPol.	PhiL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
DG(dBi)	Φ(0°)Φ(10°)	Φ(20°)Φ(30°)	Φ(40°)Φ(50°)	Φ(60°)Φ(70°)	Φ(80°)Φ(90°)	Φ(100°)Φ(110°)	Φ(120°)Φ(130°)	Φ(140°)Φ(150°)	Φ(160°)Φ(170°)	Φ(180°)Φ(190°)	Φ(200°)Φ(210°)	Φ(220°)Φ(230°)	Φ(240°)Φ(250°)	Φ(260°)Φ(270°)	Φ(280°)Φ(290°)	Φ(300°)Φ(310°)	Φ(320°)Φ(330°)	Φ(340°)Φ(350°)
Θ(0°)	-7.67/-8.97	-4.13/-2.63	-1.36/-0.52	-0.06/-0.12	-0.36/-0.22	-0.03/-0.33	-1.05/-1.96	-3.07/-4.35	-6.12/-8.27	-9.31/-7.21	-4.41/-2.47	-1.15/-0.22	0.90/0.9	-0.93/-2	0.54/-0.01	-1.15/-0.22	-3.45/-5.07	-6.41/-8.1
Θ(10°)	-11.15/-9.19	-6.55/-4.49	-2.98/-1.86	-0.96/-0.36	0.13/0.35	0.33/-0.09	-0.68/-1.41	-2.36/-3.57	-5.12/-7.05	-7.62/-5.17	-2.99/-1.36	-0.28/0.41	0.76/0.91	0.86/0.62	0.14/-0.51	-1.38/-2.82	-4.41/-6.49	-8.59/-10.89
Θ(20°)	-13.43/-12.86	-9.31/-6.58	-4.68/-3.1	-1.85/-0.88	-0.25/-0.01	-0.05/-0.47	-1.1/-2.13	-3.38/-4.98	-6.16/-8.15	-8.63/-5.93	-3.53/-1.51	-0.16/0.57	0.91/1	1.04/0.71	0.03/-1.04	-2.26/-4.08	-5.95/-8.1	-9.98/-12.32
Θ(30°)	-10.21/-12.11	-9.46/-6.96	-4.71/-3.18	-2.08/-1.12	-0.38/0.01	-0.06/-0.5	-1.23/-2.26	-3.44/-5.21	-7.61/-10.07	-11.34/-7.43	-4.82/-2.94	-1.24/-0.15	1.07/0.65	-0.33/-1.88	-3.61/-5.54	-6.67/-6.79	-6.58/-7.48	
Θ(40°)	-9.19/-9.51	-7.82/-6.02	-4.46/-3.49	-2.53/-1.34	-0.40/0.1	-0.1/-0.44	-1.02/-1.62	-2.17/-3.01	-4.48/-6.48	-8.09/-6.97	-5.13/-4.22	-3.38/-2.02	-0.74/0.3	0.67/0.27	-0.99/-2.66	-4.48/-5.73	-6.11/-5.61	-5.3/-6.32
Θ(50°)	-9.87/-9.38	-7.44/-5.7	-4.61/-3.85	-2.86/-1.56	-0.79/-0.86	-1.18/-1.25	-1.5/-2.16	-3.08/-4.24	-6.11/-8.81	-10.66/-9.3	-6.84/-5.53	-4.36/-3.27	-1.95/-0.55	-0.13/-0.41	-1.23/-2.11	-3.1/-4.19	-5.25/-5.79	-6.73/-8.47
Θ(60°)	-11.41/-9.42	-6.84/-4.87	-3.13/-1.79	-0.64/0.48	1.11/0.1	0.87/0.83	0.55/-0.32	-1.72/-3.77	-5.88/-8.13	-9.53/-10.16	-4.8/-3.22	-2.44/-1.49	-0.86/-0.58	-1.02/-1.73	-2.12/-3.1	-5.15/-7.47	-9.46/-11.75	
Θ(70°)	-10.85/-9.08	-6.45/-4.65	-3.19/-1.91	-0.9/-0.08	0.28/-0.15	-0.74/0.15	0.01/-0.77	-2.25/-4.5	-7.71/-11.42	-11.71/-10.49	-7.75/-5.26	-2.81/-1	-0.3/-0.45	-0.72/-0.88	-1.16/-1.24	-1.67/-2.55	-4.1/-5.67	-7.8/-10.34
Θ(80°)	-13.22/-12.26	-9.48/-7.88	-5.79/-2.82	-0.91/-0.25	-0.83/-1.6	-1.73/-1.12	-0.86/-1.31	-3.05/-5.75	-9.06/-13	-13.22/-12	-8.11/-5.01	-2.5/-0.82	-0.13/0.1	-0.31/-1.26	-1.64/-2.28	-3/-3.99	-4.28/-4.81	-7.22/-11.52
Θ(90°)	-13.09/-13.63	-10.25/-6.24	-4.11/-2.97	-1.96/-1.25	-1.09/-1.5	-5.03/-6.41	-7.2/-7.65	-5.68/-7.01	-12.47/-10.19	-11.71/-10.49	-7.75/-5.26	-2.81/-1	-0.3/-0.45	-0.72/-0.88	-1.16/-1.24	-1.67/-2.55	-4.1/-5.67	-7.8/-10.34
Θ(100°)	-11.3/-10.54	-8.32/-4.8	-2.27/-1	-0.49/-0.74	-1.68/-2.43	-2.56/-2.45	-2.87/-3.71	-4.63/-5.61	-7.12/-9.34	-10.04/-7.65	-5.48/-3.85	-2.75/-2.57	-1.51/-0.04	0.88/1.27	0.87/0.03	-0.96/-2.35	-4.16/-6.67	-9.9/-11.39
Θ(110°)	-10.45/-10.35	-6.67/-13.8	-0.92/0.24	0.72/0.14	-1.05/-2.11	-2.64/-2.67	-2.88/-3.81	-4.48/-5.52	-7.33/-8.12	-7.9/-7.53	-6.67/-4.77	-2.09/-0.09	1.31/1.73	1.28/0.27	-0.23/-0.36	-0.93/-2.19	-4.89/-8.4	-13.03/-12.15
Θ(120°)	-8.33/-6.63	-7.28/-6.28	-3.97/-3.33	-4.56/-5.13	-4.05/-3.23	-2.68/-1.76	-1.99/-3.1	-4.49/-6.22	-8.87/-10.84	-12.47/-10.19	-5.67/-2.69	-0.6/0.74	1.56/1.05	-1.75/-5.56	-2.32/0.79	1.91/1.55	-0.48/-3.4	-6.58/-9.63
Θ(130°)	-8.1/-4.22	-3.75/-3.88	-3.12/-2.71	-3.85/-5.3	-4.77/-4.55	-4.83/-4.58	-3.7/-3.11	-3.17/-3.71	-4.77/-6.07	-7.47/-5.16	-1.43/0.59	10.74	0.14/-1.37	-2.35/-1.39	1.29/2.94	3.21/2.33	0.67/-1.98	-6.37/-13.28
Θ(140°)	-13.19/-8.78	-6.55/-4.84	-3.14/-2.59	-3.32/-5.37	-7.33/-8.92	-8.32/-6.93	-4.85/-4.18	-5.07/-6.55	-6.89/-7.83	-10.06/-8	-3.9/-1.98	-1.87/-2.46	-3.29/-3.73	-4.89/-3.29	-1.6/0.23	0.88/0.42	-0.67/-1.87	-4.07/-8.95
Θ(150°)	-4.26/-4.42	-2.83/-3.1	-2.85/-3.04	-3.55/-4.64	-6.17/-8.02	-9.42/-9.41	-8.63/-6.4	-4.83/-4.17	-13.58/-13.84	-16.2/-0.98	-2.42/-1.9	-1.62/-0.98	0.02/1.06	1.69/1.57	0.87/-0.03	-0.81/-0.7	-1.12/-2.55	
Θ(160°)	-3.89/-4.38	-4.51/-4.74	-5.07/-5.45	-5.69/-6.1	-6.98/-8.43	-9.71/-9.14	-8.4/-7.92	-7.66/-7.07	-6.81/-5.48	-4.24/-3.69	-3.48/-3.52	-3.69/-3.68	-3.64/-3.98	-3.87/-3.38	-2.69/-1.75	-1/-0.87	-1.2/-2.12	-2.81/-3.49
Θ(170°)	-10.16/-11.65	-12.27/-11.65	-10.12/-8.62	-7.91/-8.11	-8.85/-9.02	-8.37/-7.35	-6.29/-5.44	-4.61/-3.98	-3.3/-2.8	-2.81/-3.18	-3.78/-4.3	-4.96/-5.51	-6.24/-6.6	-6.59/-5.85	-4.93/-3.91	-3.52/-3.88	-4.94/-6.51	-7.83/-8.7
Θ(180°)	-10.71/-9.58	-8.98/-8.81	-8.19/-8.01	-7.63/-7.9	-8.32/-8.23	-7.75/-6.83	-6.02/-5.38	-4.63/-4.01	-3.5/-3.2	-3.11/-3.61	-4.38/-5.46	-6.02/-6.32	-6.55/-6.42	-6.54/-6.01	-5.46/-5.52	-6.31/-7.96	-9.91/-10.87	-11.08/-11
Freq(Hz)	2.4GPol.	ThetaL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DG(dBi)	Φ(0°)Φ(10°)	Φ(20°)Φ(30°)	Φ(40°)Φ(50°)	Φ(60°)Φ(70°)	Φ(80°)Φ(90°)	Φ(100°)Φ(110°)	Φ(120°)Φ(130°)	Φ(140°)Φ(150°)	Φ(160°)Φ(170°)	Φ(180°)Φ(190°)	Φ(200°)Φ(210°)	Φ(220°)Φ(230°)	Φ(240°)Φ(250°)	Φ(260°)Φ(270°)	Φ(280°)Φ(290°)	Φ(300°)Φ(310°)	Φ(320°)Φ(330°)	Φ(340°)Φ(350°)
Θ(0°)	0.32/-0.14	-0.9/-1.84	-2.82/-3.65	-5.24/-6.83	-8.44/-9.64	-7.51/-4.99	0.75/0.31	-0.34/-1.13	-0.69/0	0.63/0.81	-0.34/-1.13	-2.04/-3.33	-4.81/-6.43	-8.29/-9.03	-0.15/0.25	2.06/-0.81	-0.25/0.25	0.51/0.53
Θ(10°)	-0.18/-0.42	-0.77/-1.32	-1.88/-2.99	-3.38/-4.27	-5.64/-5.94	-4.09/-2.23	-0.76/0.35	1.15/1.57	1.74/1.67	1.36/0.74	-0.27/-1.74	-3.19/-4.52	-5.96/-7.01	-8.99/-9.18	-7.78/-5.19	-3.23/-2.18	-1.32/-0.8	-0.36/-0.23
Θ(20°)	-0.81/-0.63	-0.74/-0.93	-1.31/-1.62	-1.95/-2.42	-2.83/-2.3	1.05/0.51	0.94/1.47	1.77/1.5	1.47/1.4	1.22/0.85	-0.13/-0.59	-1.01/-1.65	-2.56/-3.81	-4.45/-4.24	-3.82/-3.69	-3.55/-3.05	-2.26/-1.46	
Θ(30°)	-0.75/-0.23	-0.07/-0.07	-0.42/-0.78	-1.08/-1.33	-1.19/-0.31	0.49/0.96	1.22/1.32	1.36/1.41	1.47/1.4	1.22/0.85	-0.13/-0.59	-1.01/-1.65	-2.56/-3.81	-4.45/-4.24	-3.82/-3.69	-3.55/-3.05	-2.26/-1.46	
Θ(40°)	0.46/0.88	110.87	0.4/-0.2	-0.67/-0.58	0.04/0.71	1.11/23	0.97/0.57	0.06/-0.19	-0.14/0.01	0.05/-0.06	-0.03/0.15	0.36/0.52	0.53/0.16	-0.88/-1.53	-2.25/-2.32	-2.25/-2.19	-1.94/-1.47	-0.88/-0.15
Θ(50°)	0.01/0.54	0.78/0.82	0.91/-17	1.63/2.09	2.19/1.81	1.31/0.71	-1.97/-1.56	-1.03/-1.03	-1.52/-1.92	-1.42/-0.7	-0.31/-0.12	-0.19/-0.24	-0.22/-0.27	-0.59/-0.94	-0.94/-0.87	-1.06/-1.31	-1.13/-0.64	
Θ(60°)	-0.61/-0.21	0.06/0.26	0.38/0.65	1.31/1.84	1.88/1.61	1.43/1.73	1.92/1.38	0.4/-0.13	0.05/0.03	-0.53/-1.4	-2.1/-2.39	-2.68/-3.19	-3.68/-3.31	-1.96/-0.58	-0.34/-0.62	-1.21/-2.15	-3.12/-3.35	-2.45/-1.35
Θ(70°)	1.31/1.44	0.92/-0.24	-1.46/-1.08	0.87/2.57	3.35/-4.1	3.37/3.35	2.88/1.12	-1.43/-1.72	-1.71/-2.53	-3.47/-3.75	-3.31/-2.79	-1.02/-1.05	-0.87/-2.04	0.09/-0.02	-1.02/-2.17	-2.26/-1.57	-0.52/0.54	
Θ(80°)	1.36/1.99	1.92/0.9	-1.30/0.67	2.73/4.05	4.34/3.8	2.97/2.69	1.93/-0.81	-1.96/-0.18	0.35/-0.22	-0.92/-1.35	-1.64/-1.2	0.34/1.73	1.92/1.3	1.46/2.22	2.74/2.6	1.88/0.82	0.14/-0.09	-0.02/0.45
Θ(90°)	-0.58/-0.66	-0.43/-0.85	-1.10/1.3	2.83/4.53	4.98/4.12	2.25/1.15	0.68/-1.26	-0.98/0.42	0.75/0.37	-0.06/-0.39	-0.76/-0.6	0.17/0.97	1.22/1.58	1.97/2.28	2.31/1.94	1.05/0.15	-0.49/-0.61	-0.28/-0.22
Θ(100°)	-1.59/0.07	0.97/0.78	-0.06/0.59	2.82/4.09	4.31/3.9	2.92/1.58	0.45/-1.18	-1.08/0.18	-1.65/-1.93	-2.5/-1.59	-0.78/-1.52	1.30/99	-0.14/-0.53	-0.55/-1.42	-0.70/0.79	-0.55/-1.42	-2.31/-3.36	-4.15/-3.49
Θ(110°)	-0.46/1.1	2.15/1.96	0.47/0.3	2.76/3.73	3.44/2.9	2.35/1.44	0.82/-0.04	0.51/1.17	0.27/-2.09	-4.43/-5.37	-4.44/-2.21	-0.04/1.21	0.42/-1.64	-1.65/-0.31	0.83/1.88	2.33/1.33	-0.63/-1.81	-1.77/-1.41
Θ(120°)	-1.76/-0.71	0.55/0.5	-1.58/-4.22	-1.15/0.84	1.57/2.26	2.67/2.44	1.99/1.34	1.08/1.37	0.79/-1.73	-4.09/-3.64	-3.47/-0.99	1.53/2.23	0.91/-1.07	-1.7/-0.1	1.17/1.32	1.22/0.3	-1.36/-1.28	-0.55/-0.99
Θ(130°)	-6.1/-4.09	-1.37/-0.03	-0.67/-3.72	-0.82/-2.21	-0.82/0.16	0.32/-0.3	-0.47/-0.85	-0.73/-1.64	-4.12/-3.83	-2.99/-3.41	-0.17/-1.86	-0.4/-0.68	-2.36/-3.5	-2.96/-0.41	1.03/0.8	-0.12/-0.57	-1.42/-3.48	-5.34/-6.24
Θ(140°)	-4.62/-4.13	-2.87/-1.26	-0.61/-0.8	-1.58/-0.29	1.13/1.97	2.14/1.5	0.90/4.8	0.22/-0.78	-2.27/-2.98	-3.48/-4.98	-6.28/-3.5	-2.35/-1.63	-1.05/-0.11	0.46/1.07	1.71/1.62	0.83/0.07	-0.22/-1.11	-3.04/-4.92
Θ(150°)	-4.66/-2.79	-0.94/0.55	1.46/1.77	1.77/1.91	2.18/2.57	2.53/2.24	2.01/1.66	1.09/0.28	-1.05/-2.55	-4.11/-5.63	-5.7/-4.51	-3.3/-1.96	-0.67/0.1	0.51/1.07	1.64/1.73	0.87/0.84	-2.97/-4.92	-6.42/-6.17
Θ(160°)	-1.52/-1.03	-0.52/-0.23	-0.11/-0.35	-0.97/-1.66	-1.99/-2.61	-2.64/-2.39	-3.16/-1.57	-1.51/-1.65	-1.99/-2.45	-2.98/-3.34	-3.16/-2.37	-1.58/-2.31	0.24/0.58	0.06/-0.52	-1.58/-2.6	-3.24/-3.07	-2.5/-1.98	
Θ(170°)	-2.39/-2.84	-3.37/-4.06	-5.31/-6.74	-8.15/-9.03	-8.26/-6.79	-5.68/-4.81	-4.28/-4.19	-4.41/-4.88	-5.56/-5.66	-4.92/-3.75	-2.79/-1.82	-1.05/-0.55	-0.28/-0.22	-0.44/-0.99	-1.56/-2.26	-2.8/-2.96	-2.83/-2.43	-2.07/-2.06
Θ(180°)	-5.66/-0.63	-6.07/-5.64	-4.93/-4.11	-3.73/-3.6	-3.7/-3.91	-3.88/-3.83	-4.06/-4.41	-4.73/-5	-4.93/-5.08	-5.23/-5.4	-5.34/-5.14	-4.88/-4.74	-4.5/-4.26	-4.21/-4.62	-5.11/-5.63	-5.79/-5.69	-5.6/-5.31	-5.04/-5.35
Freq(Hz)	2.45GPol.	PhiL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DG(dBi)	Φ(0°)Φ(10°)	Φ(20°)Φ(30°)	Φ(40°)Φ(50°)	Φ(60°)Φ(70°)	Φ(80°)Φ(90°)	Φ(100°)Φ(110°)	Φ(120°)Φ(130°)	Φ(140°)Φ(150°)	Φ(160°)Φ(170°)	Φ(180°)Φ(190°)	Φ(200°)Φ(210°)	Φ(220°)Φ(230°)	Φ(240°)Φ(250°)	Φ(260°)Φ(270°)	Φ(280°)Φ(290°)	Φ(300°)Φ(310°)	Φ(320°)Φ(330°)	Φ(340°)Φ(350°)
Θ(0°)	-7.85/-6.21	-3.88/-4.27	-1.31/-0.48	0.16/0.63	0.89/1.05	0.99/0.69	0.12/-0.89	-2.44/-3.2	-6.37/-8.74	-10.66/-9.16	-6.31/-4.37	-2.69/-1.41	-0.45/0.3	0.91/16	1.06/0.81	0.39/-0.25	-1.3/-2.98	-5.15/-6.93
Θ(10°)	-9.56/-7.68	-5.35/-3.7	-2.49/-1.56	-0.73/0.05	0.56/0.94	0.90/0.66	0.18/-0.74	-2.15/-3.9	-5.89/-8.47	-9.92/-6.44	-4.56/-3.16	-0.95/-0.88	0.26/0.81	0.72/0.42	-0.05/-0.88	-0.20/-3.72	-5.78/-8.03	
Θ(20°)	-13.17/-9.99	-7.54/-5.54	-4.03/-2.78	-1.91/-1.02	-0.43/-0.14	-0.07/-0.21	-0.62/-1.42	-2.7/-4.67	-7.15/-10.16	-9.57/-6.73	-4.74/-3.33	-2.08/-1.05	-0.43/0.05	0.43/0.51	0.28/0.25	-1.11/-2.35	-4.08/-6.43	-9.22/-12.82
Θ(30°)	-14.82/-12.44	-9.09/-6.65	-4.89/-3.65	-2.73/-1.7	-0.92/-0.52	-0.31/-0.37	-0.68/-1.44	-2.77/-4.72	-7.13/-10.15	-9.54/-7.18	-5.74/-4.62	-3.26/-1.79						



Radiated Composite Gain Data of 2.4GHz

Appendix A

Θ (60°)	-0.39/-0.27	-0.06/0.1	0.3/1.1	2.11/2.16	1.12/-0.01	0.18/-0	-1.52/-4.1	-4.46/-2.04	-0.52/-0.06	-0.57/-1.54	-2.44/-1.77	-0.71/-0.23	-0.25/-0.19	-0.27/-0.84	-2.27/-3.31	-2.49/-1.53	-1.46/-2.44	-2.49/-1.19
Θ (70°)	0.16/0.5	0.67/0.73	0.65/0.5	0.68/0.91	0.76/0.94	1.96/2.23	0.91/-2.11	-4.44/-2.85	-1.45/-1.08	-1.58/-2.55	-3.34/-2.67	-1.71/-1.49	-1.41/-1.69	-1.66/-1.39	-1.64/-1.72	-1.7/-1.83	-2.39/-2.8	-2.34/-0.98
Θ (80°)	0.51/1.37	1.53/1.06	0.61/1.29	2.29/2.79	2.43/1.15	0.82/1.21	0.1/-3.51	-4.56/-2.32	-1.06/-1.05	-1.57/-2.42	-3.11/-3.15	-1.9/0.54	1.61/1.29	0.72/0.96	1.09/1.34	1.49/1.26	0.19/-1.31	-1.6/-0.73
Θ (90°)	-0.32/-0.06	0.11/-0.36	-1.46/-0.66	1.53/2.99	3.12/2.08	0.98/0.75	-0.37/-2.73	-2.92/-1.31	-0.55/-0.67	-1.24/-1.89	-1.73/-0.97	0.34/1.43	1.68/1.41	1.54/1.82	1.62/1.78	1.82/1.23	-0.32/-2.01	-1.56/-0.82
Θ (100°)	-1.2/-0.67	-0.18/-0.47	-1.31/-0.61	1.63/2.81	2.77/2.22	1.82/1.41	-0.64/-4.49	-5.03/-2.52	-1.1/-1.14	-1.78/-2.04	-2.48/-2.1	-0.54/0.24	0.05/0	0.57/0.58	-0.98/-2.04	-2.01/-1.88	-2.01/-2.38	-2.01/-1.48
Θ (110°)	-0.01/1.11	1.47/0.23	-1.78/-1.02	1.19/1.89	1.62/1.37	1.48/1.51	-0.03/-4.23	-3.98/-1.2	-0.46/-1.13	-1.89/-1.59	-2.1/-3.4	-2.66/-0.46	-0.07/-0.96	-0.64/-0.85	0.09/0.72	1.07/0.24	-1.29/-1.7	-1.57/-1.1
Θ (120°)	-1.52/0.01	0.64/0.51	-3.37/-4.61	-2.06/-0.75	-0.56/-0.22	0.52/1.07	0.64/-1.38	-1.91/-0.9	-0.92/-2.89	-4.66/-4.11	-3.38/-1.54	0.61/1.61	1.06/-0.55	-1.82/-1.54	-0.5/-0.26	0.24/-0.19	-1.4/-1.43	-1.27/-1.69
Θ (130°)	-5.89/-5.81	-4.94/-3.26	-3.68/-6.42	-6.03/-3.36	-2.02/-1.26	-0.92/-1.22	-2.05/-2.72	-2.56/-2.69	-2.82/-3.72	-3.51/-3.15	-2.17/-0.33	0.88/0.98	0.03/-2.01	-3.71/-2.77	-1.05/-1.24	-1.94/-2.06	-3.09/-5.52	-7.38/-6.65
Θ (140°)	-4.1/-3.73	-4.09/-3.37	-3.68/-4.3	-3.51/-1.24	0.57/1.43	1.4/0.59	-0.35/-1.06	-1.81/-3.35	-5.66/-6.4	-6.59/-7.19	-5.12/-2.2	-0.77/-0.62	-1.3/-3.01	-4.49/-3.31	-1.36/-1.01	-2.22/-3.32	-3.94/-5.35	-7.49/-6.09
Θ (150°)	-11.86/-9.65	-7.01/-3.68	-1.68/-0.59	0.24/1.13	1.87/2.35	2.23/1.72	0.98/0.2	-0.85/-2.71	-5.69/-8.32	-9.45/-7.41	-4.61/-2.54	-1.6/-1.56	-2.21/-2.78	-3.23/-2.06	-0.58/-0.02	-0.69/-2.22	-3.9/-5.62	-8.2/-11.37
Θ (160°)	-5.67/-4.6	-3.89/-2.97	-2.27/-1.97	-1.97/-2.09	-2.19/-2.1	-2.1/-2.22	-2.41/-2.72	-3.01/-3.46	-4.32/-4.85	-5/-4.68	-3.8/-2.84	-2.33/-1.98	-1.99/-1.8	-1.71/-1.7	-1.56/-1.56	-2.19/-3.77	-5.61/-7.8	-8.17/-6.99
Θ (170°)	-4.11/-4.34	-5.31/-6.82	-8.93/-10.31	-11.63/-11.88	-10.06/-8.39	-6.79/-5.88	-5.35/-5.13	-5.1/-5.2	-5.31/-5.25	-5.18/-4.83	-4.07/-3.41	-2.83/-2.65	-2.56/-2.52	-2.41/-2.82	-3.51/-4.18	-4.72/-5.35	-5.78/-5.62	-4.89/-4.38
Θ (180°)	-6.01/-6.42	-7.61/-8.19	-8.66/-7.89	-7.1/-6.58	-6.48/-6.16	-5.93/-6.04	-6.06/-6.04	-5.77/-5.78	-5.73/-5.77	-5.68/-5.78	-6.03/-6.14	-6.05/-6.06	-6.46/-6.8	-7.06/-7.51	-7.57/-7.37	-6.91/-6.2	-5.93/-5.67	-5.58/-5.65



Radiated Composite Gain Data of 2.4GHz

Appendix A

Gain Result

Freq(Hz)	2.4GPol.	Phi/Ant. 1	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	
Gain	Φ(0°)Φ(10°)	Φ(20°)Φ(30°)	Φ(40°)Φ(50°)	Φ(60°)Φ(70°)	Φ(80°)Φ(90°)	Φ(100°)Φ(110°)	Φ(120°)Φ(130°)	Φ(140°)Φ(150°)	Φ(160°)Φ(170°)	Φ(180°)Φ(190°)	Φ(200°)Φ(210°)	Φ(220°)Φ(230°)	Φ(240°)Φ(250°)	Φ(260°)Φ(270°)	Φ(280°)Φ(290°)	Φ(300°)Φ(310°)	Φ(320°)Φ(330°)	Φ(340°)Φ(350°)
Θ(0°)	-12.82/-13.3	-14.69/-15.48	-14.68/-14.93	-15.23/-16.41	-17.05/-15.76	-16.17/-15.76	-15.89/-15.24	-13.73/-12.26	-11.46/-10.93	-10.74/-10.63	-10.64/-11.26	-12.33/-13.36	-14.49/-15.29	-15.28/-16.09	-16.88/-16.94	-16.88/-17.67	-18.49/-19.6	-17.38/-14.74
Θ(10°)	-17.68/-19.03	-20.33/-18.99	-19.44/-19.33	-18.17/-17.95	-17.21/-16.73	-16.41/-16.72	-16.27/-14.8	-12.54/-10.78	-9.63/-8.88	-8.38/-8.06	-8.01/-8.56	-9.52/-10.73	-12.02/-12.97	-13.29/-13.79	-14.42/-14.92	-15.79/-17.52	-18.73/-20.12	-19.93/-19.86
Θ(20°)	-15.85/-16.92	-19.08/-19.51	-19.9/-18.87	-17.64/-17.36	-18.59/-19.06	-18.75/-18.91	-19.02/-19.71	-18.79/-15.05	-12.6/-10.78	-9.28/-8.19	-7.69/-7.95	-8.77/-10.35	-12.23/-13.48	-13.98/-14.47	-15.83/-18.01	-18.28/-20.28	-19.9/-19.32	-19.22/-17.06
Θ(30°)	-11.64/-12.45	-13.31/-13.76	-13.55/-13.07	-13.71/-14.92	-15.6/-14.72	-13.48/-13.09	-13.21/-13.87	-15.27/-16.68	-17.16/-14.35	-11.85/-10.18	-9.79/-10.19	-11.3/-13.2	-15.34/-16.57	-17.09/-18.81	-18.81/-19.54	-18.38/-19.9	-18.38/-14.63	-11.81/-10.79
Θ(40°)	-10.7/-11.6	-12.22/-12.23	-11.76/-12.07	-12.35/-12.27	-11.44/-10	-9.52/-9.32	-9.33/-9.92	-10.64/-10.88	-11.3/-11.4	-11.05/-10.49	-10.24/-10.89	-12.66/-14.69	-16.71/-17.7	-19.07/-19.35	-19.43/-16.6	-14.65/-14.3	-13.5/-11.46	-9.84/-9.54
Θ(50°)	-11.7/-13.63	-15.62/-16.35	-17.6/-19.26	-18.2/-15.44	-13.85/-15.01	-15.73/-12.93	-10.62/-10.13	-10.9/-12.39	-15.11/-18.99	-19.45/-14.28	-10.84/-9.72	-9.67/-10.3	-11.5/-12.99	-16.88/-18.32	-17.9/-14.91	-13.71/-13.86	-13.35/-11.39	-9.84/-10.14
Θ(60°)	-16.79/-19.88	-18.9/-19.87	-18.18/-16.24	-16.9/-19.11	-19.77/-19.59	-14.5/-10.19	-7.51/-5.87	-4.85/-4.62	-5.65/-8.34	-12.75/-18.66	-18.56/-19.48	-16.05/-12.85	-12.45/-14.82	-19.44/-19.34	-19.94/-19.59	-17.63/-17.94	-20.12/-17.74	-15.05/-15.54
Θ(70°)	-19.67/-19.92	-14.6/-12.22	-12.37/-12.59	-12.32/-11.99	-12.82/-16.31	-18.31/-13.03	-10.13/-8.88	-8.46/-8.37	-9.1/-11.31	-14.92/-18.92	-19.81/-19.17	-15.15/-11.61	-11.98/-16.15	-19.72/-19.13	-19.35/-19.92	-20.38/-18.5	-19.9/-19.65	-19.99/-19.52
Θ(80°)	-16.9/-20.32	-17.32/-19.08	-19.27/-18.47	-19.13/-19.21	-19.8/-19.26	-13.92/-7.56	-4.93/-4.69	-6.08/-8.88	-13.56/-18.91	-19.09/-18.17	-17.45/-15.52	-13.26/-14.32	-18.35/-19.34	-20.23/-19.82	-16.02/-15.02	-15.47/-17.19	-15.32/-11.14	-11.69/-13.96
Θ(90°)	-16.9/-20.32	-18.41/-14.57	-13.05/-14.32	-17.6/-20.74	-19.02/-19.18	-16.58/-9.49	-6.7/-6.47	-8.47/-11.53	-13.92/-12.54	-9.99/-8.36	-8.06/-8.57	-10.77/-16.26	-19.23/-18.91	-19.35/-15.79	-12.25/-11.59	-12.74/-15.96	-18.38/-14.97	-13.38/-13.92
Θ(100°)	-19.41/-20.03	-14.56/-10.42	-8.33/-7.77	-8.17/-9.18	-10.79/-12.43	-12.83/-10.77	-7.96/-6.36	-6.08/-7.69	-10.29/-11.44	-11.16/-10.5	-9.8/-9.82	-11.73/-16.27	-15.82/-17.45	-19.24/-13.76	-13.05/-15	-16.88/-17.58	-16.75/-17.41	-19.09/-19.76
Θ(110°)	-18.53/-16.13	-12.38/-8.4	-6.49/-6.87	-8.7/-11.85	-14.82/-16.49	-20.15/-17.75	-10.1/-6.72	-5.76/-7.02	-9.82/-10.38	-10.08/-10.44	-10.58/-9.2	-8.82/-10.44	-12.26/-16.44	-12.31/-11.3	-10.55/-11.65	-11.77/-18.83	-19.52/-20.32	-17.46/-11.7
Θ(120°)	-15.71/-10.34	-10.11/-9.7	-7.81/-7.87	-11.11/-19.23	-17.41/-14.44	-15.18/-9.8	-7.95/-7.18	-7.27/-9.2	-14.39/-20.14	-16.24/-14.45	-7.43/-4.84	-5.7/-8.31	-8.81/-9.37	-12.99/-18.93	-10.82/-8.3	-7.38/-7.97	-12/-17.5	-17.46/-20.02
Θ(130°)	-9.91/-6.99	-7.87/-10.58	-9.77/-9.16	-11.58/-18.19	-19.92/-13.57	-7.16/-3.62	-2.05/-2.5	-4.3/-4.93	-4.27/-4.71	-6.94/-5.16	-1.4/-0.18	-1.45/-3.67	-5.11/-7.67	-12.65/-16.89	-9.11/-5.79	-5.24/-5.18	-5.42/-7.33	-11.87/-17.01
Θ(140°)	-18.52/-18.08	-16.88/-16.94	-11.24/-9.95	-10.9/-12.73	-15.96/-15.67	-9.39/-5.55	-3.81/-3.76	-4.96/-5.87	-6.24/-7.73	-11.81/-9.11	-4.69/-3.73	-5.06/-7.03	-8.79/-11.55	-15.56/-19.76	-18.23/-11.82	-9.6/-8.81	-7.77/-7.16	-8.98/-13.74
Θ(150°)	-4.91/-6.16	-7.08/-14.48	-8.05/-9.52	-11.72/-14.35	-16.12/-15.61	-17.12/-12.19	-11.71/-12.51	-14.61/-18.41	-20.38/-16.84	-11.03/-7.54	-5.94/-5.64	-5.93/-7.08	-7.54/-5.37	-8.55/-8.92	-7.54/-5.37	-3.82/-3.21	-2.91/-2.57	-2.61/-3.37
Θ(160°)	-3.97/-5.53	-7.27/-9.15	-11.39/-13.77	-15.33/-17.11	-18.91/-20.19	-19.24/-13.74	-9.92/-7.49	-5.9/-5.17	-4.51/-3.78	-2.94/-2.4	-2.27/-2.48	-2.87/-3.34	-3.96/-4.93	-5.89/-6.03	-5.21/-4.05	-3.26/-2.94	-2.96/-3.08	-3.05/-3.22
Θ(170°)	-11.1/-13.84	-17.29/-19.27	-17.17/-14.9	-13.99/-14.79	-16.45/-15.12	-11.86/-9.12	-6.94/-5.44	-4.29/-3.49	-2.69/-1.9	-1.45/-1.18	-1.36/-1.83	-2.6/-3.24	-3.87/-4.69	-5.58/-5.94	-5.95/-5.81	-5.99/-6.5	-7.55/-8.44	-8.79/-8.62
Θ(180°)	-11.95/-10.07	-9.34/-9.13	-8.61/-8.65	-9.12/-10.77	-12.31/-12.85	-11.87/-10.37	-9.41/-8.68	-8.07/-7.33	-6.38/-5.35	-4.34/-3.63	-3.28/-3.46	-3.9/-4.37	-4.83/-5.38	-6.09/-6.45	-6.78/-7.33	-8.63/-10.99	-13.78/-15.53	-15.73/-14.06
Freq(Hz)	2.4GPol.	Theta/Ant. 1	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-
Gain	Φ(0°)Φ(10°)	Φ(20°)Φ(30°)	Φ(40°)Φ(50°)	Φ(60°)Φ(70°)	Φ(80°)Φ(90°)	Φ(100°)Φ(110°)	Φ(120°)Φ(130°)	Φ(140°)Φ(150°)	Φ(160°)Φ(170°)	Φ(180°)Φ(190°)	Φ(200°)Φ(210°)	Φ(220°)Φ(230°)	Φ(240°)Φ(250°)	Φ(260°)Φ(270°)	Φ(280°)Φ(290°)	Φ(300°)Φ(310°)	Φ(320°)Φ(330°)	Φ(340°)Φ(350°)
Θ(0°)	-17.42/-17.47	-18.69/-19.6	-19.36/-19.7	-14.93/-15.34	-14.93/-15.34	-14/-15.1	-14.83/-14.95	-16.74/-18.41	-14.26/-15.34	-12.71/-12.82	-17.23/-15.49	-13.11/-13.72	-14.26/-15.34	-12.96/-12.86	-15.18/-17.01	-15.18/-17.01	-15.18/-17.01	-15.18/-17.01
Θ(10°)	-17.37/-15.79	-14.57/-13.42	-11.92/-10.63	-9.62/-8.29	-7.71/-7.27	-7.15/-7.25	-7.27/-7.3	-7.49/-7.86	-8.2/-9.28	-10.65/-12.39	-14.93/-17.55	-20.23/-18.76	-20.33/-19.58	-20.21/-18.36	-19.25/-19	-18.36/-19.78	-19.03/-19.05	-18.84/-19.17
Θ(20°)	-9.3/-7.9	-6.96/-6.14	-5.61/-4.99	-4.49/-3.96	-3.57/-3.38	-3.47/-3.63	-4.08/-4.56	-4.95/-6.3	-6.38/-7.07	-8.12/-9.12	-10.52/-12.26	-13.92/-15.03	-16.47/-18.37	-19.83/-19.07	-19.87/-20	-19.68/-19.55	-20.28/-16.52	-13.46/-11.17
Θ(30°)	-6.75/-4.9	-3.61/-2.69	-2.32/-2.17	-2.09/-2.06	-2.1/-2.29	-2.82/-3.67	-8.96/-9.35	-4.74/-5.8	-7.57/-7.57	-7.97/-8.51	-9.98/-9.35	-13.12/-15.62	-15.86/-14.44	-13.63/-13.22	-12.51/-11.52	-12.51/-11.52	-12.51/-11.52	-12.51/-11.52
Θ(40°)	-4.53/-3.27	-2.36/-1.95	-2.04/-2.14	-2.07/-1.75	-1.53/-1.62	-2.26/-3.26	-4.7/-6.55	-9.07/-11.73	-13.31/-12.77	-11.13/-9.6	-8.14/-7.32	-6.74/-5.93	-5.31/-5.36	-6.41/-8.5	-10.27/-9.82	-8.95/-8.75	-9.14/-9.23	-8.03/-6.24
Θ(50°)	-3.2/-2.85	-3/-2.98	-2.26/-0.91	0.38/-1.3	1.06/-0.17	-1.31/-3.2	-5.79/-9.81	-14.35/-13.59	-13.33/-15.84	-19.08/-18.33	-12.09/-9.49	-8.25/-6.74	-5.14/-3.8	-3.39/-4.13	-5.97/-4.76	-7.49/-7.64	-8/-7.83	-6.19/-4.35
Θ(60°)	-2.4/-1.55	-1.1/-0.94	-0.63/-0.26	0.05/-0.05	-0.54/-1.09	-1.15/-0.72	0.88/-2.14	-3.63/-3.98	-4.32/-5.18	-6.71/-8.53	-10.55/-11.68	-11.04/-9.72	-7.72/-4.96	-2.74/-1.83	-2.49/-4.16	-5.51/-6.26	-5.61/-6.03	-5.03/-3.67
Θ(70°)	-0.97/-0.52	-0.72/-1.81	-2.88/-2.24	-0.12/-1.62	2.462/66	2.672/47	1.37/-1.92	-6.27/-4.74	-4.51/-6.71	-2.32/-1.57	-7.31/-5.37	-3.77/-2.45	-2.25/-2.78	-0.95/-1.84	-5.47/-5.24	-5.1/-3.95	-2.88/-1.88	-2.88/-1.88
Θ(80°)	-0.36/-0.17	-0.64/-1.6	-1.81/-0.3	1.73/-1.2	3.53/-2.1	2.53/-1.62	-0.34/-4.98	-4.86/-1.2	-0.76/-2.19	-3.77/-4.88	-5.78/-5.3	-3.04/-0.8	0.36/-0.5	0.43/-0.2	1.36/-0.74	-0.76/-3.15	-4.46/-3.74	-2.51/-3
Θ(90°)	-1.34/-2.26	-3.23/-3.87	-2.93/-0.19	2.323/64	3.552/28	0.82/-0.65	-2.77/-7.24	-4.97/-3.21	-3.68/-4.77	-5.34/-5.64	-6.23/-6.9	-5.1/-2.2	-0.25/-0.28	-0.1/-0.13	0.14/-0.01	-0.93/-0.27	-2.42/-2.3	-1.71/-1.12
Θ(100°)	-4.53/-2.5	-2.07/-2.3	-1.6/-0.04	1.471/88	1.15/-0.04	-0.13/-0.28	-0.45/-2.77	-1.79/-0.5	-1.84/-4.85	-7.1/-6.57	-5.08/-4.76	-4.79/-3.33	-1.54/-0.52	0.16/-0.25	-0.66/-1.66	-3.84/-8.34	-10.71/-12.13	-12.35/-8.54
Θ(110°)	-3.23/-2.99	-2.97/-2.41	-1.1/-0.51	1.45/-1.06	-0.56/-1.87	-1.15/-0.22	0.1/-45	0.72/-2.39	0.78/-3.75	-8.3/-8.77	-6.13/-2.95	-1/-0.5	-1.35/-2.69	-1.74/-0.06	0.17/-0.22	-0.79/-3.06	-5.29/-4.48	-3.74/-3.64
Θ(120°)	-3.03/-3.93	-4.85/-5.54	-5.96/-5.66	-5.18/-5.16	-4.39/-1.87	0.61/-1.91	1.37/-0.31	0.18/-1.08	-0.89/-7.04	-16.01/-12.85	-14.15/-6.83	-1.71/-0.15	-0.13/-1.63	-2.61/-1.37	-1.08/-1.97	-1.82/-2.61	-5.5/-5.97	-3.69/-2.76
Θ(130°)	-10.06/-6.94	-5.52/-5.29	-5.79/-6.48	-7.1/-7.69	-19.23/-14.38	-2.04/-1.44	-2.92/-4.99	-6.78/-7.91	-19.29/-13.77	-9.05/-11.23	-3.78/-2.68	-2.12/-2.93	-2.93/-4.15	-3.54/-3.49	-6.23/-10.9	-4.26/-4.66	-6.23/-10.9	-18.86/-15.46
Θ(140°)	-12.19/-13.08	-14.8/-13.49	-10.85/-8.08	-5.7/-3.34	-1.46/-0.18	0.42/-0.19	-0.61/-1.5	-2.45/-4.47	-6.34/-5.8	-6.12/-10.67	-18.47/-7.77	-3.95/-1.98	-0.93/-1.18	-2.56/-2.98	-1.81/-1.64	-2.75/-3.9	-4.18/-5.19	-7.96/-11.56
Θ(150°)	-5.09/-2.97	-1.51/-0.67	-0.05/-0.25	0.39/-0.54	0.59/-0.47	0.02/-0.6	-1.43/-2.16	-3/-4.1	-5.41/-6.84	-8.54/-10.71	-8.88/-5.54	-3.23/-1.53	-0.72/-1.07	-1.82/-1.58	-0.65/-0.29	-1.08/-3.12	-6.27/-9.32	-10.54/-7.92
Θ(160°)	-0.34/-0.29	0.44/-0.25	-0.29/-1.12	-2.41/-3.9	-5.69/-7.54	-9.65/-11.37	-12.27/-11.8	-11.36/-10.72	-10.43/-10.14	-9.22/-4.78	-2.44/-1.55	-1.28/-1.7	-0.47/-1.55	-2.92/-2.68	-3.09/-4.21	-4.99/-4.22	-2.79/-1.32	-2.79/-1.32
Θ(170°)	-2.46/-3.11	-4.04/-5.37	-7.14/-9.9	-13.83/-16.87	-14.31/-11.16	-9.13/-8.33	-8.28/-8.89	-10.22/-12.97	-16.85/-17.12	-12.84/-9.19	-6.93/-5.38	-4.38/-3.78	-3.46/-3.26	-3.1/-3.21	-3.36/-3.45	-3.5/-3.37	-3.04/-2.52	-2.14/-2.09
Θ(180°)	-9.51/-11.83	-13/-11.83	-9.58/-7.23	-5.56/-4.36	-3.68/-3.36	-2.95/-2.92	-3.13/-3.54	-3.91/-4.26	-5/-5.88	-7.02/-8.27	-9.21/-9.76	-9.82/-9.48	-8.72/-7.64	-6.63/-6.06	-5.53/-5.5	-5.46/-5.37	-5.51/-5.7	-6.19/-7.54
Freq(Hz)	2.45GPol.	Phi/Ant. 1	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-	+-
Gain	Φ(0°)Φ(10°)	Φ(20°)Φ(30°)	Φ(40°)Φ(50°)	Φ(60°)Φ(70°)	Φ(80°)Φ(90°)	Φ(100°)Φ(110°)	Φ(120°)Φ(130°)	Φ(140°)Φ(150°)	Φ(160°)Φ(170°)	Φ(180°)Φ(190°)	Φ(200°)Φ(210°)	Φ(220°)Φ(230°)	Φ(240°)Φ(250°)	Φ(260°)Φ(270°)	Φ(280°)Φ(290°)	Φ(300°)Φ(310°)	Φ(320°)Φ(330°)	Φ(340°)Φ(350°)
Θ(0°)	-19.95/-19.23	-18.73/-20.26	-17.99/-16.08	-14.93/-13.72	-12.47/-10.86	-9.85/-9.39	-9.69/-10.07	-11.1/-12.6	-14.29/-16.36	-18.4/-19.8	-19.46/-19.44	-18.42/-18.03	-17.36/-16.08	-14.37/-12.71	-11.67/-10.9	-10.51/-10.58	-11.9/-14.99	-19.76/-19.08
Θ(																		



Radiated Composite Gain Data of 2.4GHz

Appendix A

Θ(60°)	-1.57/-1.06	-1.3/-2.07	-2.55/-1.85	-0.39/0.56	0.73/0.26	-0.54/-1.99	-5.1/-10.63	-13.93/-8.65	-6.66/-7.23	-9.96/-13.24	-14.68/-9.4	-5.73/-3.91	-2.99/-2	-1.28/-1.6	-3.31/-4.74	-3.95/-2.96	-2.6/-2.92	-3.04/-2.63
Θ(70°)	0.17/0.79	0.99/0.86	0.37/-0.45	-0.99/-0.59	1.21/1.91	1.83/0.95	-1.25/-5.82	-9.92/-6.43	-4.52/-4.8	-6.16/-8.05	-10.14/-8.06	-3.9/-1.35	-0.54/-0.38	0.06/0.08	-0.93/-2.51	-2.86/-1.88	-1.39/-1.58	-1.6/-0.8
Θ(80°)	0.48/-1.3	1.41/0.94	0.27/-0.19	0.05/1.24	2.37/2.47	1.82/0.63	-1.99/-8.59	-1.48/-2.41	0.42/0.87	-5.6/-5.8	-3.18/-3.7	0.10	1.26/0.02	-0.86/-0.57	0.10	-0.86/-0.57	0.10	-0.56/-0.4
Θ(90°)	0.41/0.56	0.09/-1.04	-2.1/-2.37	-0.99/-1.03	2.16/2.11	1.41/0.62	-1.51/-5.93	-4.48/-1.21	-0.55/-1.79	-3.63/-5.18	-5.82/-4.9	-2.73/-1.02	-0.15/0.35	1.19/1.96	1.51/0.62	-0.04/-0.44	-0.34/-0.24	-0.31/-0.1
Θ(100°)	-2.74/-1.41	-0.3/-0.48	-1.31/-1.18	-0.10/-6.4	0.51/0.06	0.22/0.67	-0.67/-5.49	-7.25/-3.92	-2.6/-3.29	-4.93/-5.94	-6.68/-8.3	-2.82/0.01	0.63/0.34	0.69/1.16	0.3/-0.72	-1/-0.8	-0.63/-1.48	-2.45/-2.93
Θ(110°)	-1.01/0.43	0.38/-0.87	-2.05/-1.74	-0.44/0.26	-0.05/-0.37	0.20/5.7	-1.19/-7.21	-2.23/-4.79	-5.97/-4.42	-4.76/-5.95	-2.91/-0.51	-0.51/-0.84	0.45/-1.87	1.71/1.13	0.75/-0.34	-1.15/-2.19	-3.46/-3.02	
Θ(120°)	-1.04/-0.55	-1.69/-4.02	-5.77/-5.65	-4.79/-4.67	-4.28/-2.38	0.08/1.09	-0.55/-4.2	-3.14/-1.39	-3.3/-9.44	-14.75/-9.26	-7.21/-4.86	-1.99/-0.97	-1.84/-3.25	-2.45/-0.21	-0.19/-1.45	-1.29/-2.32	-4.07/-4.23	-3.75/-2.6
Θ(130°)	-7.64/-7.39	-7.13/-7.33	-8.06/-8.77	-8.94/-9.01	-7.42/-4.26	-1.65/-1.02	-2.98/-5.96	-6.23/-7.05	-10.94/-20	-15.63/-13.83	-11.81/-5.48	-2.41/-2.02	-3.07/-5.11	-5.22/-2.09	-1.44/-3.77	-5.84/-6.62	-9.53/-13.41	-10.49/-8.3
Θ(140°)	-6.63/-5.89	-7.18/-10.83	-16.4/-16.23	-11.17/-6.79	-3.49/-1.19	-1.09/-2.63	-16.4/-15.82	-4.92/-9.71	-20.05/-18.32	-16.29/-19.42	-11.46/-5.56	-3.26/-2.81	-3.22/-4.62	-6.79/-4.76	-2.87/-3.74	-6.68/-8.07	-7.28/-7.65	-9.28/-8.78
Θ(150°)	-20.17/-13.38	-9.77/-7.12	-5.16/-3.82	-2.54/-1.49	-0.6/-0.1	0.02/-0.42	-1.38/-2.78	-5.03/-8.65	-15.09/-19.22	-20.12/-14.25	-8.61/-5.31	-3.56/-2.85	-2.86/-3.7	-4.93/-4.26	-2.73/-2.53	-3.72/-5.75	-7.54/-9.02	-12.64/-19.91
Θ(160°)	-5.64/-3.8	-2.87/-2.48	-2.62/-3.21	-3.96/-4.84	-5.83/-6.94	-8.03/-9.61	-11.48/-12.78	-14.1/-15.43	-17.52/-18.31	-15.66/-11.48	-7.7/-5.03	-3.57/-3.05	-3.12/-3.56	-4.33/-4.62	-4.22/-3.78	-3.75/-4.67	-6.55/-8.79	-9.68/-8.05
Θ(170°)	-5.52/-6.25	-5.72/-6.52	-8.21/-10.77	-14.72/-20.09	-18.46/-17.14	-13.97/-12.42	-18.83/-18.92	-18.81/-15.57	-10.95/-7.91	-6.25/-5.46	-5.09/-4.99	-4.75/-4.75	-4.62/-4.5	-4.5/-4.95	-5.65/-6.34	-6.51/-6.01		
Θ(180°)	-12.59/-15.03	-19.6/-19.61	-19.2/-14.25	-11.13/-9.21	-7.74/-6.77	-6.23/-6.18	-6.11/-6.26	-6.31/-6.88	-7.76/-8.77	-9.95/-11.62	-13.32/-14.01	-12.75/-11.41	-10.82/-10.13	-9.23/-8.41	-7.57/-6.93	-6.54/-6.4	-6.57/-7.37	-8.71/-10.66
Freq(Hz)	2.4GPol.	Phi/Ant. 2	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
Gain	Φ(0°)/Φ(10°)	Φ(20°)/Φ(30°)	Φ(40°)/Φ(50°)	Φ(60°)/Φ(70°)	Φ(80°)/Φ(90°)	Φ(100°)/Φ(110°)	Φ(120°)/Φ(130°)	Φ(140°)/Φ(150°)	Φ(160°)/Φ(170°)	Φ(180°)/Φ(190°)	Φ(200°)/Φ(210°)	Φ(220°)/Φ(230°)	Φ(240°)/Φ(250°)	Φ(260°)/Φ(270°)	Φ(280°)/Φ(290°)	Φ(300°)/Φ(310°)	Φ(320°)/Φ(330°)	Φ(340°)/Φ(350°)
Θ(0°)	-19.39/-13.24	-7.88/-4.49	-2.2/-0.6	0.39/0.98	1.31/1.55	1.52/1.27	0.67/-0.28	-1.74/-3.9	-7.33/-13.25	-19.18/-12.78	-6.76/-3.44	-1.39/-0.02	0.99/1.55	1.86/1.92	1.81/1.37	0.57/-0.66	-2.33/-4.61	-7.95/-14.31
Θ(10°)	-19.36/-14.29	-8.49/-5.21	-2.82/-1.7	0.01/0.86	1.51/1.84	1.95/1.73	1.17/0.28	-1.27/-3.6	-7.29/-13.59	-18.12/-9.79	-5.27/-2.46	-0.71/-0.45	1.55/1.48	1.58/1.54	1.20/56	-0.22/-1.53	-3.05/-5.34	-8.57/-14.09
Θ(20°)	-19.1/-5.92	-9.47/-5.96	-3.7/-1.95	-0.57/0.62	1.49/1.89	2.03/1.8	1.36/0.52	-0.83/-2.99	-6.61/-12.62	-16.74/-9.18	-4.76/-2.05	-0.24/0.86	1.55/1.91	1.99/1.79	1.31/0.41	-0.78/-2.4	-4.29/-6.63	-9.68/-15
Θ(30°)	-18.39/-20.67	-11.5/-7.29	-4.62/-2.77	-1.17/0.33	1.27/1.69	1.71/1.51	1.01/0.17	-1.06/-3.08	-6.46/-12.15	-19.3/-10.11	-5.02/-2.12	-0.21/0.4	1.822/2.23	2.26/1.96	1.03/-0.41	-2.2/-4.13	-5.93/-7.69	-9.3/-12.31
Θ(40°)	-20.18/-18.8	-11.2/-7.27	-5.1/-3.51	-2/-0.49	0.43/0.8	0.79/0.54	-0.02/-0.78	-1.96/-3.68	-6.49/-11.36	-18.99/-14.17	-7.77/-2.43	-1.8/-0.09	1/1.68	1.71/1	-0.42/-2.32	-4.12/-5.12	-5.83/-6.5	-8.02/-11.32
Θ(50°)	-18.24/-19.41	-12.57/-8.22	-6.08/-4.67	-3.11/-1.28	-0.17/0.27	0.2/-0.21	-1.12/-2.16	-3.46/-5.24	-7.69/-11.29	-16.44/-16.48	-1.12/-7.36	-0.73/0.13	-1.61/-0.48	-1.11/-1.66	-2.17/-2.96	-4.5/-4.95	-5.65/-6.34	-6.51/-6.01
Θ(60°)	-19.49/-15.16	-10.6/-7.45	-5.47/-4.32	-2.47/-0.02	1.65/2.33	2.22/1.47	0.03/-2.15	-4.76/-7.89	-11.86/-14.24	-12.46/-10.03	-7.71/-5.43	-3.48/-1.68	-0.41/0.16	0.38/0.53	0.67/0.51	-0.52/-2.26	-4.71/-7.68	-11.27/-17.08
Θ(70°)	-19.29/-13.26	-8.36/-5.91	-4.25/-3.58	-3.23/-1.98	-0.31/0.98	1.68/1.44	0.16/-1.97	-4.33/-6.9	-11.7/-20.35	-16.04/-10.37	-6.03/-2.64	-0.22/-1.4	2.42/7.1	2.57/2.2	1.53/0.12	-2.03/-4.62	-6.76/-8.28	-10.24/-15.55
Θ(80°)	-19.93/-17.53	-10.23/-6.32	-3.89/-2.06	-0.95/-0.61	-1.02/-0.88	-0.37/-0.02	-8.22/-2.88	-5.23/-7.53	-19.54/-16.63	-3.312/-4.01	-0.65/-1.65	3.113/82	3.312/18	0.42/-1.83	-4.03/-6	-3.09/-4.71	-14.37/-19.73	
Θ(90°)	-17.56/-15.87	-11.99/-8.57	-6.96/-5.5	-3.48/-2	-1.44/-1.3	-1.21/-1.53	-2.54/-4.26	-6.09/-7.53	-9.7/-12.72	-14.41/-11.87	-8.05/-5.05	-2.32/-0.19	1.29/2.21	2.31/1.55	0.57/-0.08	-0.72/-1.85	-3.09/-4.64	-7.32/-12.47
Θ(100°)	-18.85/-12.19	-8.57/-6.61	-6.18/-6.41	-5.7/-4.8	-4.45/-3.87	-3.09/-3.21	-4.85/-7.25	-9.76/-11.37	-13.71/-17.55	-18.13/-14.12	-9.84/-6.14	-3.63/-1.81	-0.21/0.9	1.17/1.02	0.01/-1.8	-3.88/-6.16	-9.92/-16.81	
Θ(110°)	-18.47/-19.92	-12.14/-8.89	-7.8/-7.16	-4.78/-2.86	-18.97/-19.02	-1.55/-2.36	-8.4/-8.86	-12.23/-15.82	-18.82/-16.21	-9.63/-5.29	-2.54/-0.41	1.15/1.74	1.51/0.03	-3.74/-7.5	-1.05/-2.23	-3.14/-9.5	-14.6/-19.6	
Θ(120°)	-12.86/-12.92	-15.81/-13.42	-11.01/-12.94	-15.19/-8.35	-4.47/-2.96	-2.54/-3.1	-5.14/-7.45	-8.1/-9.64	-15.29/-19.46	-19.96/-13.54	-8.55/-5.27	-2.57/-0.37	0.84/0.51	-1.44/-4.47	-5.75/-4.15	-2.44/-2.15	-3.32/-5.88	-10.39/-14.67
Θ(130°)	-13.36/-10.83	-10.09/-8.05	-6.03/-6.16	-8.77/-10.33	-7.46/-6.65	-8.26/-11.55	-15.71/-14.88	-12.2/-12.74	-17.81/-19.13	-18.38/-15.38	-10.64/-6.34	-3.33/-1.4	-0.63/-0.99	-1.89/-2.47	-1.97/-1.27	-1/-1.8	-4.12/-7.8	-13.43/-19.05
Θ(140°)	-16.51/-15.13	-12.71/-9.41	-6.84/-6.08	-8.16/-15.11	-18.95/-20.66	-18.81/-16.95	-12.76/-12.34	-14.33/-19.48	-18.98/-18.52	-18.8/-18.42	-13.02/-8.48	-6.62/-3.75	-2.82/-2.58	-2.51/-2.35	-1.89/-1.68	-1.81/-2.52	-4.18/-6.66	-10.04/-14.91
Θ(150°)	-11.4/-10.55	-9.79/-8.5	-6.75/-5.57	-5.99/-6.9	-9.11/-12	-13.68/-12.4	-10.99/-11.85	-14.39/-18.76	-19.35/-18.41	-19.61/-16.31	-10.77/-9.73	-6.32/-4.37	-3.12/-2.35	-2/-1.98	-4.32/-4.02	-5.77/-8.12	-10.85/-12.08	
Θ(160°)	-14.61/-12.16	-10.82/-9.72	-8.19/-6.74	-6.11/-6.47	-7.63/-4.95	-11.21/-12.7	-14.79/-17.85	-19.99/-19.17	-20.39/-18.51	-17.05/-16.14	-14.82/-12.96	-11.15/-9.06	-7.97/-7.48	-7.9/-9.24	-11.29/-13.14	-13.76/-14.02	-14.39/-16.95	-18.62/-18.88
Θ(170°)	-19.83/-19.9	-20.27/-17.29	-14.27/-12.07	-11.11/-11.61	-12.66/-13.76	-14.37/-14.55	-14.38/-13.92	-12.77/-12.08	-11.76/-12.09	-13.03/-14.09	-15.75/-17.16	-17.99/-18.51	-19.77/-19	-18.53/-19.56	-18.42/-15.35	-14.03/-14.21	-14.94/-16.85	-20.12/-19.34
Θ(180°)	-16.94/-18.32	-19.23/-20.58	-19.1/-20.26	-18.89/-18.58	-18.29/-18.06	-17.13/-15.15	-13.58/-12.52	-11.08/-11.6	-12.39/-14.37	-13.15/-15.2	-19.21/-18.81	-12.42/-12.54	-20.31/-19.75	-19.75/-16.57	-13.52/-12.54	-12.51/-12.89	-13.48/-14.87	
Freq(Hz)	2.4GPol.	Theta/Ant. 2	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
Gain	Φ(0°)/Φ(10°)	Φ(20°)/Φ(30°)	Φ(40°)/Φ(50°)	Φ(60°)/Φ(70°)	Φ(80°)/Φ(90°)	Φ(100°)/Φ(110°)	Φ(120°)/Φ(130°)	Φ(140°)/Φ(150°)	Φ(160°)/Φ(170°)	Φ(180°)/Φ(190°)	Φ(200°)/Φ(210°)	Φ(220°)/Φ(230°)	Φ(240°)/Φ(250°)	Φ(260°)/Φ(270°)	Φ(280°)/Φ(290°)	Φ(300°)/Φ(310°)	Φ(320°)/Φ(330°)	Φ(340°)/Φ(350°)
Θ(0°)	1.64/1.44	1.06/0.48	-0.32/-1.69	-3.7/-6.96	1.08/1.1	1.77/1.75	-4.16/-2.1	-0.66/0.33	1.08/1.51	1.71/7.75	-3.56/-1.85	-13.22/-7	1.5/0.9	-0.21/-1.85	-4.05/-7.47	-3.56/-1.53	-0.21/0.71	1.25/1.58
Θ(10°)	0.30/1.2	-0.22/-0.72	-1.55/-2.92	-4.92/-8.26	-14.89/-19.98	-11.16/-5.87	-2.76/-0.81	0.57/1.48	2.132/5.4	2.662/48	2.07/1.21	-0.05/-1.74	-4.09/-7.51	-13.15/-19.64	-15.51/-8.63	-5.09/-3.06	-1.72/-0.84	-0.19/0.14
Θ(20°)	-1.57/-1.65	-2.08/-2.7	-3.77/-5.37	-7.69/-12	-18.93/-16.72	-8.88/-4.88	-2.3/-0.62	0.65/1.54	2.18/2.51	2.522/28	1.74/0.9	0.34/-1.97	-4.19/-7.2	-12.18/-19.06	-19.41/-11.35	-7.42/-5.14	-3.86/-2.87	-2.18/-1.76
Θ(30°)	-2.63/-2.6	-3.22/-4.24	-5.9/-7.95	-10.83/-15.13	1.27/1.44	1.35/0.96	-1.98/-0.87	-0.01/0.74	-1.54/-3.02	-4.89/-7.04	-19.31/-16.06	-1.54/-3.02	-4.89/-7.04	-13.71/-15.5	-19.31/-16.06	-1.54/-3.02	-4.89/-7.04	-10.56/-12.3
Θ(40°)	-2.7/-2.55	-3.2/-4.62	-6.73/-9.27	-12.1/-14.05	-12.13/-8.77	-6.4/-0.1	-2.94/-2.35	-1.94/-1.54	-1.23/-1.18	-1.44/-1.93	-2.41/-3.01	-3.88/-5.09	-6.45/-8.05	-10.37/-12.9	-14.25/-13.14	-11.24/-9.32	-7.32/-5.65	-4.4/-3.3
Θ(50°)	-3.87/-3.6	-3.89/-5.26	-7.42/-10.07	-11.96/-12.59	-11.54/-9.77	-7.67/-6.05	-4.97/-4.21	-3.65/-3.16	-2.96/-2.92	-3.24/-3.66	-4.21/-5.16	-6.72/-8.65	-10.63/-11.76	-11.23/-9.8	-8/-7.01	-6.4/-5.91	-5.65/-5.27	-4.65/-4.24
Θ(60°)	-8.78/-8.67	-9.14/-9.8	-12.23/-15.14	-16.46/-15.55	-13.8/-11.63	-9.28/-7.1	-5.44/-4.61	-4.32/-3.48	-5.39/-6.86	-16.01/-10.25	-7.81/-6.77	-5.18/-19.58	-9.32/-9.74	-15.15/-18.58	-16.01/-10.25	-7.81/-6.77	-6.84/-7.99	-9.42/-9.04
Θ(70°)	-5.83/-6.57	-8.32/-10.6	-12.3/-12.69	-12.73/-12.33	-11.15/-10.05	-8.61/-7.57	-7.14/-7.93	-9.74/-9.41	-7.29/-6.57	-6.84/-7.61	-8.29/-9.14	-9.21/-9.07	-10.77/-16.52	-20.74/-14.85	-13.43/-13.32	-13.02/-11.01	-9.31/-8.73	-7.64/-6.26
Θ(80°)	-7.36/-7.13	-8.03/-10.77	-13.31/-12.21	-11.57/-11.62	-10.4/-8.89	-7.76/-7.25	-8.18/-11.99	-14.43/-10.64	-8.86/-8.81	-9.08/-8.52	-8.04/-7.85	-7.87/-9.27	-12.4/-16.06	-13.98/-11.21	-9.52/-8.66	-8.01/-7.22	-6.55/-7.02	-7.78/-7.96
Θ(90°)	-12.65/-14.02	-14.97/-18.79	-18.98/-18.67	-19.88/-18.07	-12.84/-9.71	-8.1/-7.83	-8.57/-8.25	-8.66/-11.6	-13.32/-9.88	-8.58/-8.68	-8.57/-8.25	-8.63/-11.7	-12.82/-14.89	-11.35/-13.65	-12.82/-11.51	-13.35/-13.65	-10.35/-10.78	
Θ(100°)	-8																	



Radiated Composite Gain Data of 2.4GHz

Appendix A

Θ(160°)	-13.64/-13.34	-13.56/-13.66	-11.65/-9.1	-7.35/-6.83	-7.44/-8.8	-10.91/-13.69	-17.41/-20.24	-19.72/-18.98	-18.71/-18.69	-17.63/-16.35	-14.5/-11.95	-9.73/-8.17	-7.01/-6.54	-6.49/-7.15	-8.37/-9.61	-10.03/-9.98	-10.4/-11.25	-13.15/-14.21
Θ(170°)	-19.22/-19.14	-19.03/-18.88	-16.19/-13.06	-11.38/-11.56	-12.59/-14.67	-17.1/-19.23	-19.74/-19.22	-17.91/-17.16	-16.79/-17.83	-19.12/-19.31	-19.75/-20.14	-19.94/-19.59	-19.32/-19.49	-19.14/-18.95	-18.76/-20.02	-17.99/-17.97	-17.6/-18.33	-18.42/-20.08
Θ(180°)	-19.91/-19.31	-19.34/-18.45	-19.65/-19.94	-18.85/-19.94	-15.56/-15.09	-16.71/-16.59	-16.22/-16.77	-15.49/-16	-16.2/-18.49	-19.23/-18.49	-17.52/-19.91	-18.67/-19.13	-19.82/-17.72	-15.42/-13.93	-13.28/-13.33	-14.07/-15.06	-15.81/-16.71	-18.32/-19.7
Freq(Hz)	2.4835GPol	ThetaAnt. 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gain	Φ(0°)/Φ(10°)	Φ(20°)/Φ(30°)	Φ(40°)/Φ(50°)	Φ(60°)/Φ(70°)	Φ(80°)/Φ(90°)	Φ(100°)/Φ(110°)	Φ(120°)/Φ(130°)	Φ(140°)/Φ(150°)	Φ(160°)/Φ(170°)	Φ(180°)/Φ(190°)	Φ(200°)/Φ(210°)	Φ(220°)/Φ(230°)	Φ(240°)/Φ(250°)	Φ(260°)/Φ(270°)	Φ(280°)/Φ(290°)	Φ(300°)/Φ(310°)	Φ(320°)/Φ(330°)	Φ(340°)/Φ(350°)
Θ(0°)	2.25/2.13	1.78/1.17	0.11/-1.52	-3.73/-6.95	-12.39/-19.79	-15.23/-8.05	-0.17/-1.69	0.01/1.5	1.72/2.05	2.11/1.98	1.51/0.82	-0.29/-1.9	-4.09/-7.57	-14.05/-20.24	-11.48/-6.39	-3.43/-1.42	0.07/1.13	1.83/2.21
Θ(10°)	1.57/-1.49	1.28/0.75	-0.21/-1.68	-3.85/-7.3	-12.91/-18.78	-13.88/-7.22	-3.54/-1.1	0.56/1.62	2.19/2.48	2.48/2.18	1.58/0.62	-0.64/-2.47	-5.06/-8.53	-14.71/-19.86	-12.3/-7.48	-4.47/-2.37	-0.92/0.21	0.99/1.44
Θ(20°)	0.61/0.46	0.16/-0.43	-1.37/-3.03	-5.17/-8.76	-15.84/-20.05	-12.43/-6.98	-3.7/-1.3	0.36/1.34	2.12/3.2	2.26/1.88	1.15/0.1	-1.34/-3.29	-5.92/-9.17	-14.16/-19.91	-14.3/-9.13	-5.93/-3.68	-2.11/-0.85	0.02/0.49
Θ(30°)	-0.3/-0.46	-0.86/-1.63	-2.65/-4.22	-6.46/-10.48	-20.57/-19.68	-10.65/-6.6	-3.91/-1.96	-0.59/0.34	0.92/1.26	1.26/0.83	0.13/-0.89	-2.23/-4.07	-6.31/-8.93	-13.3/-18.88	-16.91/-10.13	-6.72/-4.42	-2.94/-1.81	-1.03/-0.54
Θ(40°)	-1.1/-1.13	-1.6/-2.34	-3.28/-4.56	-6.51/-10.36	-17.61/-15.41	-8.74/-5.51	-3.65/-2.46	-1.46/-0.72	-0.19/-0.09	-0.35/-0.79	-1.41/-2.35	-3.53/-4.72	-6.34/-8.84	-12.98/-18.91	-19.15/-11.41	-8.22/-6.26	-4.79/-3.57	-2.44/-1.58
Θ(50°)	-2.39/-2.36	-2.66/-3.48	-4.31/-9.47	-6.12/-8.52	-12.91/-15.06	-10.45/-7	-5.33/-3.43	-3.57/-2.67	-2.33/-2.42	-2.87/-3.36	-3.9/-4.57	-5.48/-6.53	-7.8/-9.76	-13.09/-18.34	-17.51/-12.8	-9.1/-6.88	-5.42/-4.21	-3.32/-2.61
Θ(60°)	-5.34/-5.31	-5.1/-5.85	-6.75/-7.02	-7.17/-8.81	-13.21/-19.25	-13.2/-9.02	-6.87/-6.02	-5.4/-8.53	-4.56/-4.75	-5.03/-5.45	-6.12/-7.13	-8.31/-9.94	-12.14/-13.95	-15.38/-14.59	-17.73/-6.97	-6.7/-6.45	-6.11/-5.63	
Θ(70°)	-8.7/-9.1	-8.99/-9.42	-9.97/-9.99	-9.24/-10.13	-13.61/-15.52	-10.59/-7.51	-6.35/-6.35	-6.82/-6.92	-6.88/-6.83	-7.48/-8.5	-9.06/-9.06	-9.09/-9.52	-11.33/-16.17	-20.18/-14.35	-11.3/-9.74	-9.43/-9.88	-10.83/-10.7	-10.44/-9.5
Θ(80°)	-8.03/-7.71	-8.62/-10.71	-10.32/-8.53	-7.86/-8.89	-11.41/-14.61	-12.47/-8.23	-6.71/-7.48	-9.31/-9.52	-8.44/-8.18	-9.04/-9.78	-8.87/-8.06	-7.58/-7.92	-8.97/-12.96	-18.37/-14.09	-10.57/-8.18	-8.09/-7.94	-8.68/-9.09	-9.14/-8.77
Θ(90°)	-9.89/-9.28	-9.87/-12.97	-16.01/-11.67	-10.79/-11.99	-14.63/-17.85	-17.72/-11.27	-7.93/-7.56	-8.23/-9.05	-8.77/-8.5	-9.77/-9.56	-8.95/-8.52	-8.32/-9.02	-11.73/-13.33	-10.28/-9.16	-9.5/-10.49	-11.61/-10.67	-10.06/-9.84	
Θ(100°)	-7.43/-8.36	-10.47/-14.79	-19.86/-19.36	-15.76/-15.48	-17.61/-19.62	-20.29/-18.59	-19.25/-18.53	-19.46/-17.76	-13.77/-12.35	-12.4/-12.66	-11.68/-10.88	-11.37/-13.31	-17.77/-18.71	-15.22/-12.34	-11.81/-11.98	-12.24/-11.99	-10.19/-8.44	-7.39/-7.01
Θ(110°)	-8.1/-7.72	-8.93/-14.09	-19.24/-16.59	-15.45/-17.7	-18.58/-18.19	-20.1/-16.89	-13.31/-13.5	-14.56/-12.54	-9.82/-8.73	-9.16/-9.18	-8.36/-8.18	-8.21/-8.44	-11.02/-18.88	-15.89/-13.51	-12.41/-11.7	-10.06/-8.15	-6.65/-6.88	-8.22/-8.72
Θ(120°)	-9.41/-7.54	-7.12/-9.24	-14.97/-19.94	-18.66/-15.81	-14.27/-14.03	-18.19/-18.64	-11.64/-11.51	-15.23/-12.83	-8.43/-7.89	-19.01/-20.22	-11.31/-9	-7.38/-7.9	-10.74/-15.68	-19.01/-20.22	-13.02/-9.89	-8.73/-7.5	-6.29/-6.08	-7.41/-9.45
Θ(130°)	-12.3/-9.99	-7.92/-7.82	-10.88/-19.47	-19.74/-14.6	-13.44/-13.42	-15.55/-19.43	-15.89/-12.38	-14.27/-16.8	-12.28/-11	-13.35/-13.02	-9.18/-7.47	-8.01/-10.49	-13.69/-17.32	-19.12/-15.58	-10.05/-8.17	-7.79/-7.93	-8.28/-8.94	-10.17/-11.88
Θ(140°)	-10.19/-8.6	-7.3/-7.28	-9.68/-14.63	-16.79/-14.75	-15.74/-18.69	-19.55/-20.2	-14.92/-9.85	-7.92/-8.58	-10.98/-14.43	-15.33/-12.72	-10.32/-9.79	-11.66/-13.57	-14.81/-18.92	-19.58/-16.62	-12.16/-9.8	-8.88/-9.11	-10.78/-11.5	-11.25/-10.89
Θ(150°)	-12.17/-11.91	-11.06/-10.39	-10.85/-11.96	-12.88/-14.34	-11.74/-18.74	-19.99/-18.37	-15.26/-11.85	-9.73/-9.55	-11.24/-14.28	-16.31/-15.52	-14.62/-14.11	-13.99/-14.41	-17.18/-18.45	-17.13/-13.45	-10.16/-8.81	-8.74/-9.5	-10.67/-11.44	-11.24/-11.88
Θ(160°)	-15.41/-16.67	-17.42/-15.94	-14.14/-13.08	-13.29/-14.66	-17.92/-19.14	-19.03/-16.82	-14.95/-15	-15.8/-17.1	-20.01/-19.85	-19.51/-19.15	-17.11/-14.76	-14.55/-15.14	-18.37/-20	-20.16/-17.93	-15.02/-13.99	-15.16/-18.6	-18.77/-20.01	-16.57/-14.94
Θ(170°)	-13.16/-13.87	-15.41/-17.32	-18.03/-17.2	-16.08/-16.13	-16.52/-16.79	-19.88/-19.23	-16.78/-17.27	-18.23/-18.94	-18.93/-19.32	-19.12/-19.95	-19.44/-19.61	-18.66/-19.99	-20.12/-20.59	-20.29/-19.1	-19.48/-20.33	-20.12/-19.86	-19.62/-17.57	-14.4/-13.1
Θ(180°)	-12.13/-12.06	-15.92/-13.76	-14.42/-14.72	-14.5/-14.31	-15.24/-15.89	-16.64/-18.2	-19.17/-19.98	-19.8/-19.78	-19.14/-19.16	-18.15/-17.35	-17.21/-17.28	-18.67/-16.32	-16.22/-16.5	-17.47/-19.38	-20.03/-20.13	-19.81/-18.82	-19.91/-17.66	-14.58/-12.49
Freq(Hz)	2.4GPol	PhiAnt. 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gain	Φ(0°)/Φ(10°)	Φ(20°)/Φ(30°)	Φ(40°)/Φ(50°)	Φ(60°)/Φ(70°)	Φ(80°)/Φ(90°)	Φ(100°)/Φ(110°)	Φ(120°)/Φ(130°)	Φ(140°)/Φ(150°)	Φ(160°)/Φ(170°)	Φ(180°)/Φ(190°)	Φ(200°)/Φ(210°)	Φ(220°)/Φ(230°)	Φ(240°)/Φ(250°)	Φ(260°)/Φ(270°)	Φ(280°)/Φ(290°)	Φ(300°)/Φ(310°)	Φ(320°)/Φ(330°)	Φ(340°)/Φ(350°)
Θ(0°)	-8.4/-7.18	-6.21/-5.77	-5.6/-5.69	-1.36/-1.23	-6.68/-7.93	-8.13/-9.19	-10.76/-15.53	-5.69/-6.45	-16.31/-12.71	-16.15/-5.6	-10.76/-8.96	-7.45/-6.45	-6.61/-7.58	-8.81/-9.94	-8.1/-9.54	-11.02/-11.26	-10.69/-9.66	
Θ(10°)	-12.35/-10.56	-9.31/-8.59	-7.96/-7.62	-7.39/-7.32	-7.31/-7.49	-8.02/-9.18	-10.36/-11.79	-13.14/-14.05	-14.06/-13.97	-13.36/-12.54	-10.92/-9.02	-7.5/-6.54	-6.06/-5.79	-6.1/-6.73	-7.5/-8.25	-9.35/-11.04	-13.04/-14.83	-15.37/-14.18
Θ(20°)	-20.41/-13.47	-16.74/-13.86	-11.84/-10.46	-9.58/-8.98	-8.46/-8.52	-9.29/-10.53	-12.22/-14.41	-16.5/-17.28	-16.44/-16.22	-16.35/-17.17	-15.75/-11.51	-8.78/-7.11	-6.34/-5.89	-6.12/-6.72	-7.68/-8.81	-10.47/-12.85	-15.82/-19.36	-19.07/-19.91
Θ(30°)	-16.34/-20.15	-19.94/-17.07	-13.61/-12.97	-11.98/-10.32	-9.51/-9.48	-10.74/-12.97	-19.26/-18.92	-19.41/-19.57	-19.54/-18.85	-19.17/-8.98	-7.09/-6.93	-12.04/-14.31	-14.99/-14.22	-12.04/-14.31	-14.99/-14.22	-13.47/-13.93		
Θ(40°)	-13.49/-13.92	-14.72/-14.48	-13.08/-12.32	-11.74/-10.59	-9.49/-9.84	-10.99/-12.41	-13.98/-13.78	-11.81/-10.93	-10.82/-11.01	-10.75/-10.99	-12.3/-15.62	-17.81/-14.03	-9.84/-6.97	-5.33/-5.09	-6.28/-8.83	-12.88/-16.6	-17.43/-15.5	-13.07/-12.71
Θ(50°)	-15.21/-1.28	-9.51/-9.82	-8.18/-7.55	-7.44/-7.65	-7.99/-8.89	-9.74/-10.53	-11.09/-11.7	-11.77/-11.18	-11.4/-12.29	-12.03/-12.02	-12.93/-15.88	-18.67/-19.36	-14.07/-8.25	-5.32/-4.65	-6.1/-9.05	-12.9/-16.36	-19.7/-19.86	
Θ(60°)	-13.36/-10.18	-8.42/-6.67	-5.16/-3.79	-2.92/-2.84	-3.68/-5.48	-17.21/-7.72	-11.35/-17.58	-19.21/-19.52	-19.71/-19.77	-15.42/-16.85	-18.72/-11.72	-7.58/-6.94	-8.91/-11.9	-10.92/-10.03	-11.77/-14.4	-17.52/-17.02		
Θ(70°)	-10.93/-10.73	-11.83/-11.6	-9.22/-6.14	-4.02/-3.49	-4.52/-7.6	-11.83/-10.49	-7.88/-7.37	-9.08/-14.05	-19.72/-20.26	-18.97/-19.9	-19.32/-20.27	-19.64/-19.56	-19.69/-18.26	-16.62/-15.61	-13.34/-8.24	-5.33/-4.66	-5.68/-7.71	-10.52/-11.91
Θ(80°)	-18.12/-16.19	-17.22/-19.61	-17/-9.27	-5.14/-6.38	-4.69/-7.4	-11.69/-14.45	-20.67/-14.47	-15.11/-18.91	-18.8/-17.63	-15.84/-15.68	-14.89/-15.13	-16.24/-15.19	-16.17/-19.31	-19.09/-19.1	-12.92/-9.26	-7.35/-6.32	-6.21/-7.39	-10.37/-16.13
Θ(90°)	-19.29/-19.72	-15.89/-10.91	-7.8/-5.9	-4.73/-4.25	-4.91/-6.27	-8.41/-11.37	-16.26/-20.29	-20.24/-16.92	-12.86/-12.03	-13.62/-17.31	-16.99/-13.86	-10.47/-10.11	-14.61/-13.42	-7.05/-4.46	-4.35/-5.9	-8.32/-10.49	-10.67/-11.35	-13.54/-17.16
Θ(100°)	-12.02/-15.44	-19.59/-12.84	-6.74/-3.66	-2.75/-3.52	-3.57/-7.33	-12.81/-13.36	-16.82/-13.05	-11.44/-10.58	-9.94/-6.36	-8.27/-9.83	-3.79/-3.66	-6.27/-9.83	-9.94/-6.36	-5.23/-7.23	-7.81/-8.48	-10.82/-15.04	-18.12/-13.1	
Θ(110°)	-10.99/-11.41	-10.01/-6.72	-3.38/-1.02	-0.56/-2.1	-5.08/-8.2	-9.06/-8.36	-8.98/-10.59	-11.24/-10.16	-10.2/-11.53	-11.38/-11.3	-14.98/-19.19	-11.96/-6.75	-4.04/-2.61	-2.3/-3.51	-4.35/-5.91	-8.82/-14.37	-20.49/-12.89	
Θ(120°)	-11.29/-11.14	-11.23/-10.45	-7.79/-5.18	-4.84/-6.29	-10.03/-15.93	-18/-11.14	-8.16/-7.1	-6.97/-7.57	-9.98/-13.93	-16.05/-17.33	-19.73/-16.29	-9.03/-5.31	-4.3/-5.13	-9.25/-13.88	-4.62/-0.98	-0.21/-1	-3.04/-5.53	-8.5/-10.84
Θ(130°)	-16.65/-9.61	-7.79/-7.61	-8.3/-7.37	-6.31/-7.9	-6.45/-9.09	-11.72/-15.42	-9.79/-8.1	-9.18/-9.56	-11.21/-15.52	-12.80/-45	-10.95/-4.72	-16.84/-8.42	-5.68/-8.42	0.58/-0.82	-2.96/-5.32	-8.72/-17.49		
Θ(140°)	-19.08/-6.62	-6.38/-5.82	-6.42/-6.54	-5.92/-5.57	-6.5/-8.81	-13.52/-19.14	-18.68/-14.91	-13.59/-13.97	-14.72/-15.18	-15.28/-13.19	-10.49/-9.08	-10.04/-13.53	-19.98/-19.03	-15.38/-9.89	-5.79/-3.12	-2.22/-3.01	-4.59/-6.14	-8.14/-13.92
Θ(150°)	-13.01/-11.96	-8.86/-7.67	-8.14/-8.87	-8.74/-8.59	-9.25/-11.42	-15.2/-19.93	-19.76/-17.42	-17.64/-18.88	-15.95/-13.13	-11.83/-11.82	-12.63/-14.72	-20.18/-18.9	-19.35/-14.62	-11.37/-8.13	-5.18/-3.06	-2.04/-2.12	-3.23/-4.58	-6.09/-8.76
Θ(160°)	-10.81/-11.35	-10.19/-9.68	-10.25/-11.7	-12.64/-12.24	-12.16/-13.09	-19.19/-15.48	-16.07/-16.74	-19.95/-16.15	-13.57/-13.21	-13.59/-14.99	-14.02/-9.67	-7.32/-6.19	-4.34/-5.8					
Θ(170°)	-16.08/-16.55	-14.5/-13.65	-13.62/-13.44	-13.19/-12.54	-12.32/-12.66	-13.37/-13.72	-14.03/-14.42	-14.99/-15.02	-14.3/-13.88	-14.68/-17.66	-19.73/-19.41	-19.08/-19.08	-19.89/-18.75	-15.55/-11.25	-8.92/-7.51	-6.85/-7.12	-8.35/-10.55	-12.37/-14.08
Θ(180°)	-17.17/-17.11	-15.61/-14.66	-14.3/-13.07	-11.84/-10.73	-10.44/-10.08	-10.01/-10.15	-9.94/-9.69	-9.04/-8.41	-7.98/-8.07	-8.77/-10.64	-13.37/-16.5	-18.57/-18.6	-16.8/-14.61	-13.26/-12.31				



Radiated Composite Gain Data of 2.4GHz

Appendix A

Θ(50°)	-18.17/-12.23	-10.21/-9.11	-8.52/-8.89	-10.27/-12.67	-15.51/-16.14	-14.56/-13.17	-11.71/-11.34	-12.45/-14.36	-16.62/-17.62	-15.97/-13.5	-13.19/-14.29	-18.36/-19.6	-18.97/-11.51	-6.56/-4.52	-5.06/-7.98	-13.05/-18.65	-18.95/-19.92	-18.71/-19.64
Θ(60°)	-12.84/-8.51	-6.46/-5.24	-4.13/-3.12	-2.78/-3.58	-6.06/-10.18	-12.1/-11.16	-11.63/-14.58	-19.84/-14.75	-11.84/-11.63	-13.3/-16.01	-20.42/-19.76	-18.54/-13.18	-11.63/-9.2	-5.52/-3.7	-4.65/-8.6	-12.02/-10.21	-9.62/-11.53	-14.08/-15.55
Θ(70°)	-10.1/-9.11	-8.05/-6.81	-5.09/-3.27	-1.83/-1.82	-3.78/-8.61	-15.32/-11.42	-10.12/-12.62	-15.57/-12.53	-9.99/-9.75	-11.3/-16.04	-19.58/-20.04	-18.3/-14.54	-12.22/-9.45	-7.52/-7.58	-11.65/-11.07	-5.05/-2.52	-2.57/-4.67	-8.28/-10.56
Θ(80°)	-16.03/-16.02	-18.94/-19.32	-14.8/-7.83	-4.4/-3.8	-5.37/-9.04	-16.43/-13.82	-9.75/-9.39	-10.83/-12.86	-13.87/-13.11	-14.4/-16.82	-13.76/-12.25	-13.18/-15.06	-17.56/-15.35	-14.38/-18.56	-18/-7.56	-3.62/-2.06	-2.19/-4.12	-8.45/-14.86
Θ(90°)	-20.19/-16.61	-13.45/-10.38	-7.66/-5.68	-4.2/-4.17	-5.43/-7.08	-8.58/-10.08	-10.91/-11.13	-11.89/-14.78	-17.43/-16.83	-18.11/-15.11	-11.44/-10.19	-9.7/-10.11	-16.98/-16.68	-7.38/-4.54	-4.43/-5.62	-7.08/-7.95	-7.86/-8.94	-12.92/-19.28
Θ(100°)	-14.91/-19.31	-19.38/-11.89	-6.69/-3.61	-2.57/-3.56	-6.05/-8.36	-9.41/-9.83	-11.38/-13.43	-15/-14.47	-13.6/-13.7	-16.62/-12.91	-10.21/-10	-9.52/-9.98	-9.98/-5.22	-1.98/-1.48	-3.27/-6.7	-9.21/-9.61	-10.33/-12.86	-18.9/-18.97
Θ(110°)	-9.33/-9.33	-8.2/-6.06	-3.4/-0.97	-0.53/-2.47	-6.09/-9.89	-11.73/-12.02	-12.63/-14.22	-17.96/-18.92	-11.73/-11.43	-13.45/-10.36	-9.97/-14.44	-19.56/-9.99	-4.36/-1.45	-0.17/-0.93	-2.73/-3.54	-3.45/-4.4	-6.7/-11.24	-17.74/-11.35
Θ(120°)	-11.98/-10.7	-9.51/-8.64	-6.97/-4.7	-4.77/-7.17	-10.52/-14.09	-19.25/-16.48	-11.23/-9.02	-8.56/-10.06	-12.93/-14.71	-14.32/-12.55	-13.37/-17.89	-15.69/-7.57	-4.07/-2.96	-4.14/-10.42	-9.39/-2.35	-0.34/-0.62	-2.32/-4.78	-8.37/-12.1
Θ(130°)	-20.07/-11.09	-8.59/-8.43	-9.67/-9.52	-7.72/-6.66	-6.77/-8.71	-13.14/-19.09	-19.06/-12	-9.14/-8.68	-9.39/-11.38	-12.07/-10.41	-8.38/-7.77	-9.35/-11.33	-11.76/-12.4	-15.6/-10.26	-3.45/-0.02	0.9/0.07	-1.7/-3.77	-7.19/-15.28
Θ(140°)	-19.01/-13.78	-8.97/-7.93	-8.74/-9.4	-8.51/-7.43	-7.78/-10.32	-15.79/-19.2	-17.44/-13.7	-12.57/-13.27	-14.48/-16.91	-18.13/-13.82	-10.02/-8.47	-8.99/-11.31	-13.45/-14.81	-18.04/-19.63	-11.26/-5.47	-3.2/-3.12	-4.32/-5.72	-7.38/-12.02
Θ(150°)	-12.34/-18.44	-15.23/-12.85	-12.46/-12.26	-10.74/-9.66	-10.17/-12.89	-16.83/-17.1	-13.43/-12.22	-13.73/-16.45	-16.66/-15.85	-15.24/-15.24	-14.97/-17	-19.7/-19.23	-18.85/-19.51	-18.91/-20.2	-12.78/-7.2	-4.44/-3.68	-4.29/-5.44	-6.44/-8.07
Θ(160°)	-10.32/-14.38	-16.71/-15.73	-15.39/-14.17	-11.95/-10.34	-10.22/-10.71	-10.81/-10.25	-9.7/-10.6	-13.33/-18.87	-19.75/-15.5	-13.11/-12.47	-12.99/-14.71	-16.46/-18.46	-19.99/-19.84	-18.22/-19.73	-12.65/-8.31	-6.18/-5.31	-5.5/-6.49	-7.14/-8.23
Θ(170°)	-16.99/-19.85	-20.38/-16.42	-14.79/-12.72	-10.5/-9.09	-8.62/-8.47	-8.28/-8.34	-8.63/-9.56	-11.97/-17.09	-19.5/-18.85	-16.5/-15.48	-15.94/-17.85	-18.61/-19.46	-19.39/-18.51	-19.35/-13.72	-10.45/-8.39	-7.43/-7.47	-8.41/-10.15	-11.72/-13.05
Θ(180°)	-19.2/-14	-11.41/-11.02	-10.8/-9.7	-8.39/-7.57	-7.29/-7.24	-7.27/-7.38	-7.89/-8.37	-9.28/-10.19	-11.01/-11.4	-11.95/-13.1	-15.15/-18.04	-20.05/-20.32	-18.52/-16.75	-14.48/-12.87	-12.01/-11.65	-11.88/-13.65	-17.13/-19.56	-18.8/-20.02
Freq(Hz)	2.48350/Pol.	Theta/Ant. 3	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
Gain	Φ(0°)/Φ(10°)	Φ(20°)/Φ(30°)	Φ(40°)/Φ(50°)	Φ(60°)/Φ(70°)	Φ(80°)/Φ(90°)	Φ(100°)/Φ(110°)	Φ(120°)/Φ(130°)	Φ(140°)/Φ(150°)	Φ(160°)/Φ(170°)	Φ(180°)/Φ(190°)	Φ(200°)/Φ(210°)	Φ(220°)/Φ(230°)	Φ(240°)/Φ(250°)	Φ(260°)/Φ(270°)	Φ(280°)/Φ(290°)	Φ(300°)/Φ(310°)	Φ(320°)/Φ(330°)	Φ(340°)/Φ(350°)
Θ(0°)	-9.37/-10.08	-10.97/-11.81	-13.19/-15.03	-14.97/-12.86	-10.68/-8.99	-7.32/-6.39	-5.79/-5.58	-5.72/-6.36	-6.88/-7.47	-8.28/-9.26	-10.77/-12.95	-15.39/-15.26	-13.3/-10.85	-8.74/-7.6	-6.82/-6.01	-5.62/-5.58	-5.71/-6.21	-7.34/-8.47
Θ(10°)	-9.43/-10	-10.5/-10.98	-11.23/-11.08	-10.5/-9.79	-8.85/-7.56	-6.2/-5.48	-5.26/-5.45	-6.35/-7.54	-8.64/-10.05	-11.89/-14.49	-18.7/-19.93	-18.37/-17.39	-12.86/-9.62	-7.51/-6.41	-5.77/-5.35	-5.33/-5.33	-5.66/-6.37	-7.27/-8.43
Θ(20°)	-15.36/-16.01	-15.95/-15.16	-13.8/-11.21	-9.22/-7.95	-7.05/-5.86	-5.26/-5.33	-6.08/-7.58	-9.67/-11.92	-14.08/-15.34	-16.49/-18.15	-18.91/-16.3	-12.66/-9.55	-7.08/-5.2	-4.01/-3.56	-3.71/-4.17	-4.97/-6.08	-7.55/-9.17	-11.23/-13.43
Θ(30°)	-14.09/-13.81	-14.03/-13.85	-13.3/-11.89	-10.49/-8.94	-6.93/-5.09	-4.44/-4.99	-6.41/-8.64	-10.2/-10.55	-10.45/-11.04	-12.23/-13.48	-12.99/-10.43	-7.99/-5.34	-3.24/-1.9	-1.51/-1.66	-2.34/-3.53	-5.28/-7.56	-10.06/-12.38	-13.94/-14.35
Θ(40°)	-9.72/-9.58	-8.24/-6.91	-6.31/-6.08	-6.18/-7.38	-7.74/-6.1	-4.75/-4.95	-6.58/-8.08	-7.88/-6.44	-5.34/-5.05	-5.79/-7.2	-8.49/-7.96	-6.69/-3.05	-1.22/-0.42	-0.44/-0.89	-1.6/-3.06	-5.13/-7.15	-8.18/-8.24	-8.48/-9.18
Θ(50°)	-17.48/-13.23	-8.7/-5.5	-3.8/-2.89	-2.92/-4.16	-5.95/-6.06	-5.24/-5.36	-7.27/-9.38	-8.62/-6.31	-4.15/-3.13	-3.14/-4.04	-5.18/-5.33	-3.93/-2.07	-0.81/-0.56	-0.8/-1.39	-2.49/-4.46	-6.74/-7.28	-7.31/-8.53	-11.89/-16.5
Θ(60°)	-11.01/-11.99	-10.36/-6.87	-4.61/-2.96	-1.79/-2.03	-3.55/-4.57	-4.29/-4.7	-7.05/-10.87	-10.52/-7.4	-4.79/-3.01	-2.58/-3.12	-4.02/-3.95	-3.17/-2.73	-2.76/-3.1	-3.8/-5.13	-7.83/-11.42	-11.86/-10.66	-11.7/-18.6	-19.88/-12.07
Θ(70°)	-8.47/-8.23	-8.06/-7.08	-5.91/-4.91	-3.95/-3.96	-5.49/-5.74	-3.87/-3.07	-4.8/-8.75	-11.58/-9.9	-7.57/-6.06	-5.52/-5.69	-5.75/-5.58	-7.27/-11.41	-11.63/-10.09	-9.76/-11.21	-11.6/-9.23	-8.69/-11.15	-15.41/-17.8	-14.38/-10.46
Θ(80°)	-8.32/-6.86	-5.71/-5.44	-5.64/-3.65	-1.48/-1.16	-2.99/-6.72	-7.28/-5.53	-6.12/-8.84	-11.72/-12.45	-10.18/-8.23	-6.89/-7.11	-8.45/-10.54	-11.11/-6.09	-3.36/-3.35	-4.41/-5.68	-5.82/-3.67	-2.43/-3.54	-8.15/-17.18	-16.23/-11.28
Θ(90°)	-10.44/-10.2	-7.48/-5.19	-5.68/-4.68	-1.06/0.55	-0.66/-1.96	-3.98/-5.34	-7.56/-9.34	-11.18/-12.29	-10.45/-7.18	-5.71/-5.84	-5.18/-4.37	-3.27/-1.95	-1.31/-1.54	-2.07/-3.51	-4.57/-3.05	-1.87/-2.54	-7.04/-19.28	-15.47/-11.54
Θ(100°)	-9/-8.59	-7.32/-5.82	-5.56/-3.97	-0.56/1.2	1.51/1.02	0.12/-1.51	-4.81/-8.33	-7.33/-5.51	-4.74/-4.55	-4.38/-3.99	-3.44/-3.22	-3.96/-4.99	-5.38/-4.78	-4.52/-6.62	-11.86/-14.1	-12.45/-12.71	-17.43/-20.48	-14.27/-10.41
Θ(110°)	-7.02/-5.93	-3.74/-3.4	-5.82/-4.83	-1.23/-0.06	-0.23/-0.47	-0.62/-1.41	-3.9/-7.6	-9.02/-6.95	-5.24/-4.75	-5.31/-6.14	-7.96/-11.14	-15.3/-9.87	-6.11/-5.52	-8.08/-18.46	-10.64/-6.32	-5.13/-7.36	-16.41/-14.25	-8.25/-6.88
Θ(120°)	-12.8/-8.51	-4.42/-3.62	-6.34/-8.04	-3.44/-1.49	-1.73/-2.73	-3.03/-2.99	-3.56/-4.74	-5.68/-6.35	-6.11/-5.99	-6.04/-6.58	-6.63/-5.6	-3.95/-2.08	-1.33/-2.23	-5.39/-8.47	-7.28/-5.77	-5.14/-5.91	-8.78/-8.93	-7.5/-9.18
Θ(130°)	-13.09/-16.85	-17.17/-9.04	-6.89/-8.95	-7.85/-3.93	-2.68/-3.45	-4.97/-5.85	-6.06/-5.64	-4.32/-3.32	-2.79/-2.54	-2.21/-2.17	-2.56/-2.94	-2.36/-1.43	-1.62/-3.31	-6.55/-10.28	-8.55/-6.69	-6.62/-6.04	-6.13/-9.21	-17.6/-15.58
Θ(140°)	-10.33/-12.1	-13.46/-6.85	-3.69/-2.91	-2.67/-1.3	0.15/0.45	-0.56/-2.32	-4.41/-6.5	-7.2/-6.41	-5.67/-5.72	-6.26/-7.56	-8.21/-6.14	-3.93/-3.36	-4.16/-5.62	-6.56/-6.8	-5.76/-4.92	-5.72/-7.19	-8.44/-11.88	-18.88/-13.55
Θ(150°)	-20.19/-19.84	-15.47/-8.15	-4.6/-2.84	-1.86/-0.56	0.71/1.33	1.11/0.33	-0.79/-2.04	-3.31/-4.95	-6.94/-8.82	-9.58/-8.48	-6.72/-5.15	-4.77/-5.4	-6.29/-6.28	-5.62/-5.32	-4.75/-4.18	-4.7/-6.18	-8.11/-10.9	-15.59/-20
Θ(160°)	-13.55/-12.85	-11.91/-9.9	-8.01/-6.59	-5.52/-4.37	-3.01/-1.94	-1.41/-1.25	-1.24/-1.32	-1.25/-1.37	-1.72/-2.3	-3.06/-3.96	-4.94/-5.93	-6.48/-6.02	-5.05/-3.82	-2.9/-2.98	-3.68/-4.42	-5.64/-7.51	-9.83/-12.32	-13.98/-14.01
Θ(170°)	-9.63/-10.39	-11.95/-14.81	-19.52/-19.93	-18.92/-14.62	-11.21/-8.51	-6.98/-5.95	-5.14/-4.51	-3.93/-3.31	-2.86/-2.7	-2.64/-2.88	-3.18/-3.58	-3.79/-3.83	-3.94/-3.88	-3.92/-5	-6.7/-8.43	-10.14/-11.44	-11.56/-10.66	-9.8/-9.6
Θ(180°)	-8.29/-7.94	-8.17/-8.76	-9.38/-9.9	-10.5/-11.26	-12.47/-12.65	-12.42/-12.03	-11.81/-11.13	-10.3/-9.51	-8.51/-7.61	-6.76/-6.16	-5.83/-5.71	-6.26/-7.12	-8.37/-9.61	-10.77/-12.32	-13.7/-14.31	-13.61/-11.88	-10.31/-9.31	-8.93/-8.55