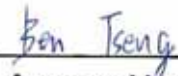




# Antenna Composite Gain Test Report

Equipment	WiFi 7 Tri-radio concurrent indoor ceiling mount AP
Brand Name	Senao
Model Name	IAP2701A
Applicant	Senao Networks, Inc. 3F., No.529, Zhongzheng Rd., Xindian Dist., New Taipei City, Taiwan
Manufacturer	Senao Networks, Inc. 3F., No.529, Zhongzheng Rd., Xindian Dist., New Taipei City, Taiwan
Standard	KDB 662911 D03 v01
Sample Received	Mar. 01, 2024
Start Test Date	Mar. 11, 2024
Final Test Date	Mar. 11, 2024

  
Approved by: **Ben Tseng**

**SPORTON INTERNATIONAL INC. Hsinhua Laboratory**  
No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)



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### 1. Operation Mode and Antenna Information

Antenna Position	RF Port	Brand Name	Model Name	Ant. Type	Connector	Modes of Operation
2G Ant1	1	Senao	5718A0751300	PIFA	I-Pex	2.4GHz
2G Ant2	2	Senao	5718A0750300	PIFA	I-Pex	2.4GHz
5G Ant1	3	Senao	5718A0753300	PIFA	I-Pex	5GHz
5G Ant2	4	Senao	5718A0752300	PIFA	I-Pex	5GHz
6G Ant1	5	AWAN	7102A0951000	Alford Loop	I-Pex	6GHz
6G Ant2	6	AWAN	7102A0952000	Alford Loop	I-Pex	6GHz
BLE	7	Senao	5718A0751300	PIFA	I-Pex	BT

Note:

**2.4GHz Operation Mode (2TX/2RX)**

2G Ant1, 2G Ant2 could transmit/receive simultaneously.

**5GHz Operation Mode (2TX/2RX)**

5G Ant1, 5G Ant2 could transmit/receive simultaneously.

**6GHz Operation Mode (2TX/2RX)**

6G Ant1, 6G Ant2 could transmit/receive simultaneously.

**BT Operation Mode (1TX/1RX)**

BLE could transmit/receive.

### 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
2400-2483.5	2450
2400-2483.5	2483.5
5150-5250	5200
5250-5350	5300
5470-5725	5600
5725-5850	5785

### 3. Testing Location

<b>Test Lab. : Sporton International Inc. Hsinhua Laboratory</b>				
<input checked="" type="checkbox"/> Wen 33rd.St.	<b>ADD:</b>	No.14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)		
	<b>TEL:</b>	886-3-318-0787	<b>FAX:</b>	886-3-318-0287
<b>Test Condition</b>	<b>Test Site No.</b>	<b>Test Engineer</b>	<b>Test Environment</b>	<b>Test Date</b>
Radiated	05CH03-HY	Rofy Chen	23.5~24.5°C / 45~55%	11/Mar/2024

Note:

Testing Site Information

Brand Name: TDK

Dimension: 11m\*6m\*6m

Characteristic: Fully Anechoic Chamber

#### 4. Test Facility and Configuration

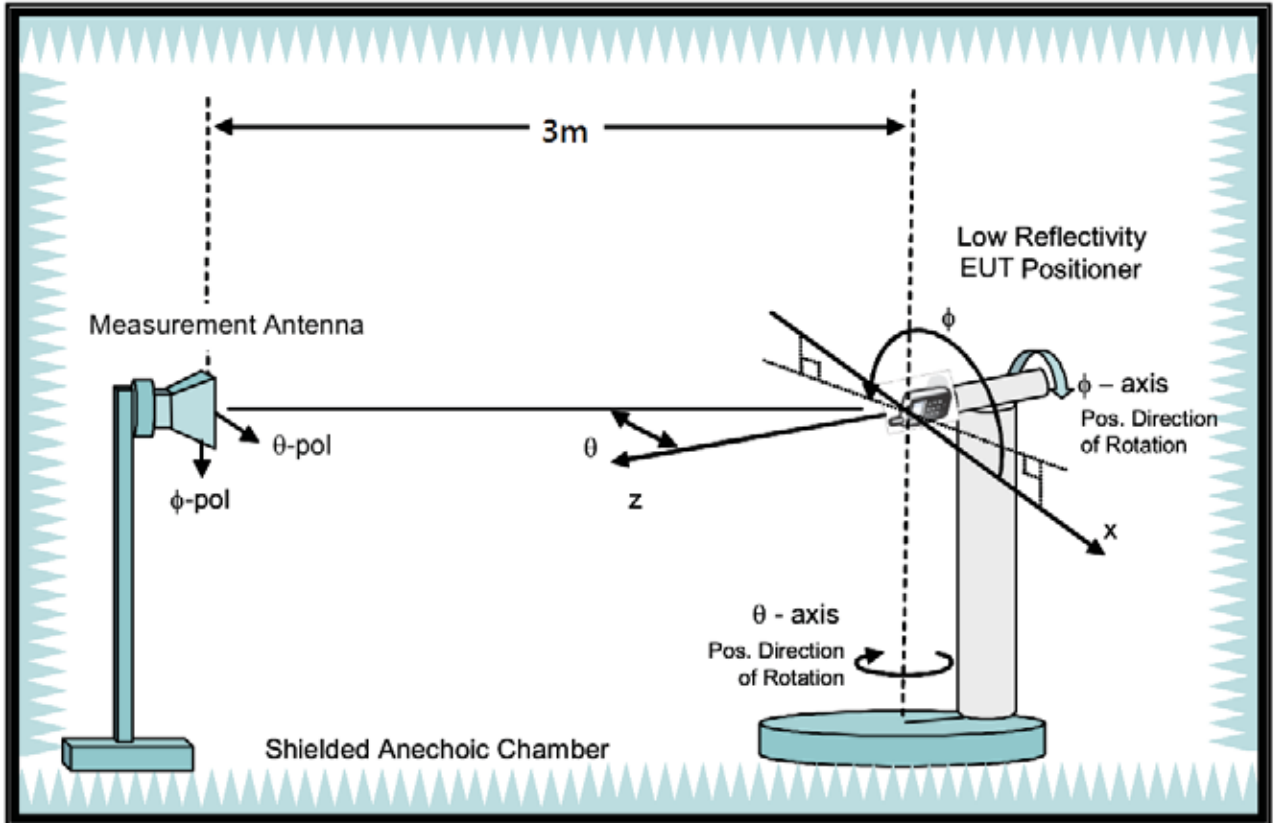
Test configuration: Reference to CITA OTA distributed-axes system configuration.

Chamber: Fully Anechoic Chamber.

Measurement antenna: Dual Polarization Horn antenna

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

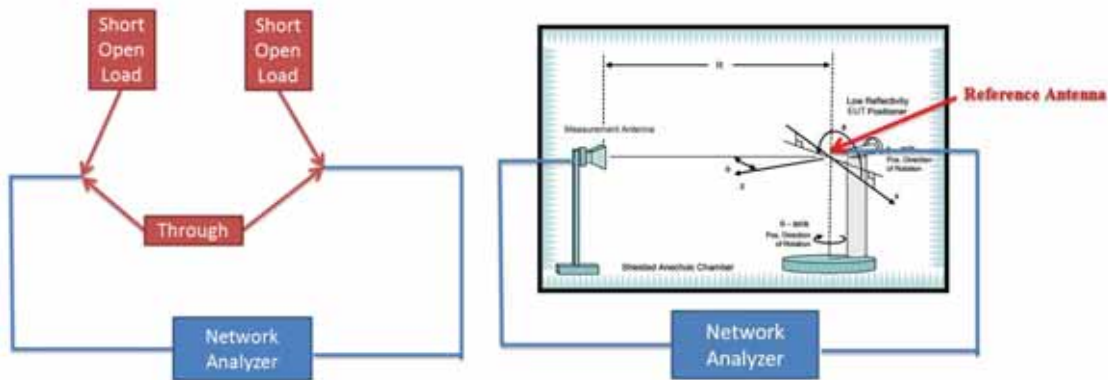
#Reference to CTIA “ctia-test-plan-for-wireless-device-over-the-air-performance-ver-3-7-1”



### 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)	-33.75	-33.64	-32.91	-32.21	-32.45	-32.33	-32.57	-32.94	-32.78	-33.35	-32.91	-33.81	-34.54	-35.64
G(phi) reading (dB)	-33.19	-32.12	-32.48	-32.51	-32.64	-31.68	-32.24	-32.45	-32.45	-32.85	-32.45	-33.62	-34.48	-35.24
Reference gain (dBi)	10	10.4	10.6	12.3	12.5	13.3	13.3	13.2	13.1	13	13.2	12.4	11.8	11.1
Factor(theta) (dB)	43.75	44.04	43.51	44.51	44.95	45.63	45.87	46.14	45.88	46.35	46.11	46.21	46.34	46.74
Factor(phi) (dB)	43.19	42.52	43.08	44.81	45.14	44.98	45.54	45.65	45.55	45.85	45.65	46.02	46.28	46.34

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)	2.4G	2.45G	2.4835G
Ant. 1 (dBi)	1.76	-0.07	1.02
Ant. 2 (dBi)	-1.4	1.79	1.98
DG [1SS] (dBi)	3.33	3.92	4.52
Polarization	Phi	Theta	Theta
$\Theta(^{\circ})$	22.5	60	60
$\Phi(^{\circ})$	15	60	240

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

#### DG\_1SS Max Value Position

Frequency (Hz)	5.2G	5.3G	5.6G	5.785G
Ant. 1 (dBi)	5.55	2.29	5.74	5.37
Ant. 2 (dBi)	1.5	5.41	2.94	0.69
DG [1SS] (dBi)	6.77	7	7.46	6.35
Polarization	Theta	Theta	Theta	Theta
$\Theta(^{\circ})$	67.5	60	67.5	45
$\Phi(^{\circ})$	322.5	210	315	322.5

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^(1.76/20)	10^(-0.07/20)	10^(1.02/20)
Ant. 2 [10^(G/20)]	10^(-1.4/20)	10^(1.79/20)	10^(1.98/20)
Ant. 1 [10^(G/20)] value	1.225	0.992	1.125
Ant. 2 [10^(G/20)] value	0.851	1.229	1.256
Sum All Antenna [Amax]	2.076	2.221	2.381
DG [10*log(Amax^2/Nant)]	3.33	3.92	4.52

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\*log(10^(Gant1/20)+10^( Gant2/20)+ +10^( Gant3/20) +10^( Gant4/20)+.....)^2/Nant)

DG\_1SS Max Value Position Calculation

Frequency (Hz)	5.2G	5.3G	5.6G	5.785G
Ant. 1 [10^(G/20)]	10^(5.55/20)	10^(2.29/20)	10^(5.74/20)	10^(5.37/20)
Ant. 2 [10^(G/20)]	10^(1.5/20)	10^(5.41/20)	10^(2.94/20)	10^(0.69/20)
Ant. 1 [10^(G/20)] value	1.895	1.302	1.936	1.856
Ant. 2 [10^(G/20)] value	1.189	1.864	1.403	1.083
Sum All Antenna [Amax]	3.083	3.166	3.339	2.938
DG [10*log(Amax^2/Nant)]	6.77	7	7.46	6.35

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\*log(10^(Gant1/20)+10^( Gant2/20)+ +10^( Gant3/20) +10^( Gant4/20)+.....)^2/Nant)



### 8. Summary of Test Result

Freq(Hz)	2.4G	2.45G	2.4835G
Ant. 1 Max Gain (dBi)	2.24	1.21	2.09
Ant. 2 Max Gain (dBi)	1.11	2.35	3.12
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/52.5/22.5	Theta/82.5/60	Phi/30/22.5
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/60/165	Theta/37.5/255	Theta/37.5/247.5
Max Gain (dBi)	2.24	2.35	3.12
DG [1SS] (dBi)	3.33	3.92	4.52
DG [2SS] (dBi)	2.24	2.35	3.12

Note:

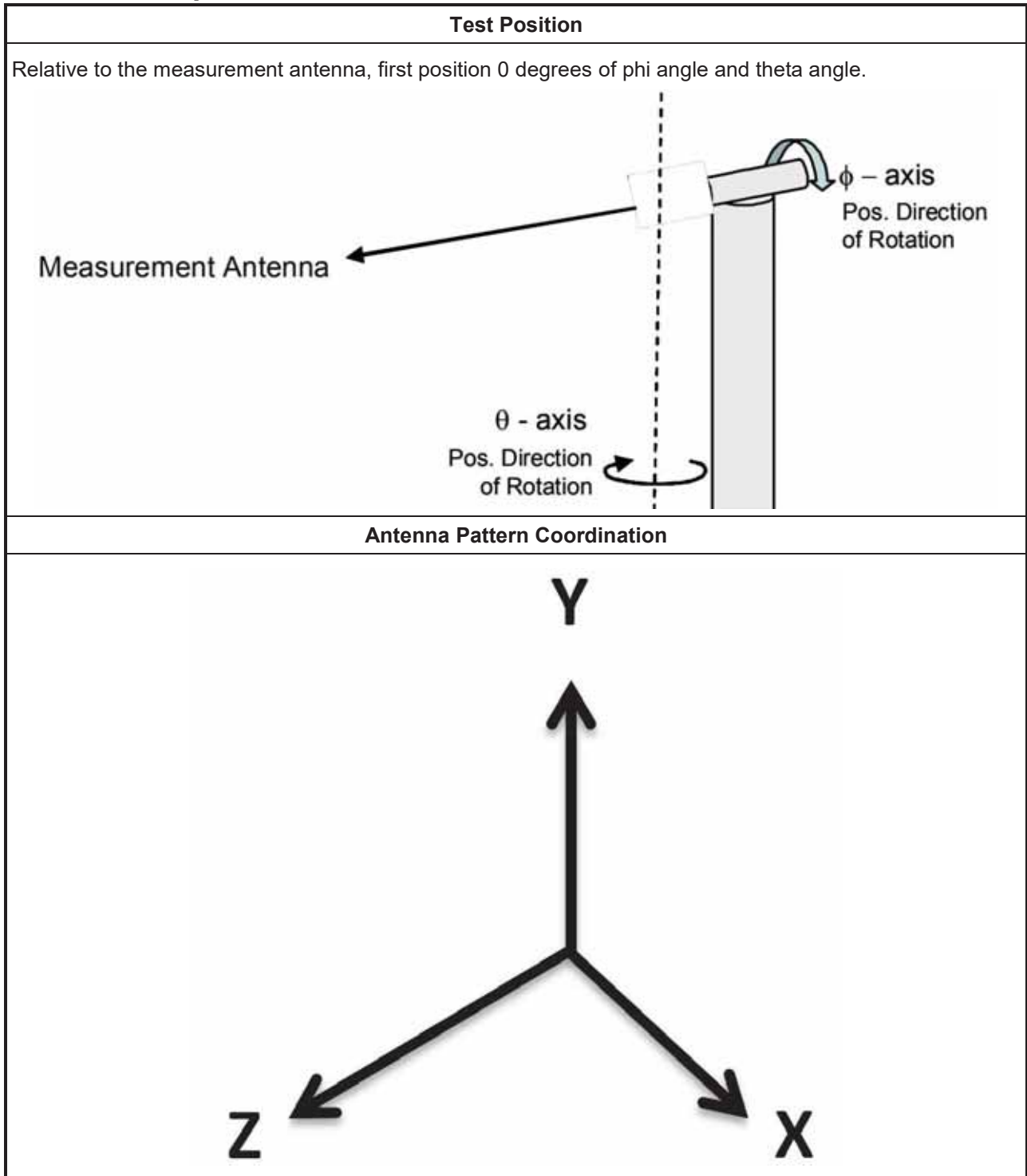
1. Antenna max gain is the max value of each individual antenna through all measurement angles.
2. The max gain is the max value of all antennas.
3. Directional Gain (2SS) = Directional Gain (1SS) – 3dB. If directional gain is less than max gain, use max gain as directional gain. Refer to KDB662911D01 (F) (2) (e) (ii)
4. Directional Gain (4SS) = Directional Gain (1SS) – 6dB. If directional gain is less than max gain, use max gain as directional gain. Refer to KDB662911D01 (F) (2) (e) (ii)

Freq(Hz)	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	5.55	5.98	5.87	5.49
Ant. 2 Max Gain (dBi)	5.48	5.41	4.88	4.65
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/67.5/322.5	Theta/82.5/307.5	Theta/60/315	Theta/67.5/322.5
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/60/210	Theta/60/210	Theta/60/202.5	Theta/45/232.5
Max Gain (dBi)	5.55	5.98	5.87	5.49
DG [1SS] (dBi)	6.77	7	7.46	6.35
DG [2SS] (dBi)	5.55	5.98	5.87	5.49

Note:

5. Antenna max gain is the max value of each individual antenna through all measurement angles.
6. The max gain is the max value of all antennas.
7. Directional Gain (2SS) = Directional Gain (1SS) – 3dB. If directional gain is less than max gain, use max gain as directional gain. Refer to KDB662911D01 (F) (2) (e) (ii)
8. Directional Gain (4SS) = Directional Gain (1SS) – 6dB. If directional gain is less than max gain, use max gain as directional gain. Refer to KDB662911D01 (F) (2) (e) (ii)

### 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 11, 2023	May 10, 2024
Dual Polarization Horn Antenna	Sporton	S0209DP	S0209DP-001	2GHz~9GHz	N.C.R.	N.C.R.
ENA Series Network Analyzer	AGILENT	E5071C	MY46419477	100kHz~8.5GHz	Jul. 28, 2023	Jul. 27, 2024
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.

NCR means Non-Calibration required.



## 11. Test Results

Please refer to the appendix.

Appendix A – Radiated Composite Gain of 2.4GHz.....Page 14  
Appendix B – Radiated Composite Gain of 5GHz.....Page 20  
Appendix C – Antenna Pattern of 2.4GHz.....Page 27  
Appendix D – Antenna Pattern of 5GHz..... Page 30  
Appendix E – Test Photos..... Page 33

————THE END————



## Radiated Composite Gain Data of 2.4GHz

## Appendix A

Freq(Hz)	2.4G	2.45G	2.4835G
Ant. 1 Max Gain (dBi)	2.24	1.21	2.09
Ant. 2 Max Gain (dBi)	1.11	2.35	3.12
Ant. 1 Polarization/ $\theta(^{\circ})/\phi(^{\circ})$	Theta/52.5/22.5	Theta/82.5/60	Phi/30/22.5
Ant. 2 Polarization/ $\theta(^{\circ})/\phi(^{\circ})$	Theta/60/165	Theta/37.5/255	Theta/37.5/247.5
Max Gain (dBi)	2.24	2.35	3.12
DG [1SS] (dBi)	3.33	3.92	4.52
DG [2SS] (dBi)	2.24	2.35	3.12



# Radiated Composite Gain Data of 2.4GHz

# Appendix A

## DG 1SS Result

Freq(MHz)	2.4GHz	Phi	0°(°)	15°(°)	30°(°)	45°(°)	60°(°)	75°(°)	90°(°)	105°(°)	120°(°)	135°(°)	150°(°)	165°(°)	180°(°)	195°(°)	210°(°)	225°(°)	240°(°)	255°(°)	270°(°)	285°(°)	300°(°)	315°(°)	330°(°)	345°(°)		
DG080	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	
DG081	1.942	1.889	1.340	0.964	2.186	2.326	0.860	4.153	-2.46	1.076	0.419	-0.040	0.080	0.366	0.20	-1.962	3.514	-5.516	0.885	4.453	-2.677	1.677	0.663	0.019	0.277	1.216		
DG082	2.810	3.021	2.417	0.794	-1.932	4.844	-1.932	2.571	-1.521	-1.161	-1.12	-1.512	-1.28	-1.4	-1.512	-1.28	-1.4	-1.512	-1.28	-1.4	-1.512	-1.28	-1.4	-1.512	-1.28	-1.4	-1.512	-1.28
DG083	1.812	2.037	2.973	1.696	-3.864	7.126	-4.853	2.63	-1.96	-1.531	-1.4	0.620	0.805	0.610	-0.22	-0.43	-1.18	-1.716	1.767	2.227	-2.775	-2.982	-3.344	-3.674	-5.581	-3.971	0.315	
DG084	0.1094	1.782	2.52	1.150	-3.87	8.93	-6.154	4.65	-2.13	-1.512	-1.28	0.620	0.805	0.610	-0.22	-0.43	-1.18	-1.716	1.767	2.227	-2.775	-2.982	-3.344	-3.674	-5.581	-3.971	0.315	
DG085	-0.1338	-0.161	0.21	1.043	-4.194	-13.14	10.08	-7.284	-3.42	-1.971	-1.47	0.963	0.361	1.51	0.519	-2.98	-2.43	-1.78	-1.882	-2.88	-1.86	-2.039	-2.628	-3.067	-2.247	-3.312	-2.973	
DG086	-0.4389	-1.591	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
DG087	0.5757	-3.48	-0.21	0.423	-5.177	-12.01	10.08	-7.284	-3.42	-1.971	-1.47	0.963	0.361	1.51	0.519	-2.98	-2.43	-1.78	-1.882	-2.88	-1.86	-2.039	-2.628	-3.067	-2.247	-3.312	-2.973	
DG088	-0.7462	-0.62	-0.21	0.423	-5.177	-12.01	10.08	-7.284	-3.42	-1.971	-1.47	0.963	0.361	1.51	0.519	-2.98	-2.43	-1.78	-1.882	-2.88	-1.86	-2.039	-2.628	-3.067	-2.247	-3.312	-2.973	
DG089	0.4448	-0.44	-1.77	-1.03	-2.52	-6.18	4.59	-13.12	-13.53	-4.64	-6.04	-6.04	-6.04	-6.04	-6.04	-6.04	-6.04	-6.04	-6.04	-6.04	-6.04	-6.04	-6.04	-6.04	-6.04	-6.04	-6.04	-6.04
DG090	-1.5124	-4.49	-4.21	-3.62	-3.04	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG091	0.3186	-4.87	-4.24	-3.62	-3.04	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG092	-0.0574	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG093	-0.3883	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG094	0.3186	-4.87	-4.24	-3.62	-3.04	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG095	-0.0574	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG096	-0.3883	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG097	0.3186	-4.87	-4.24	-3.62	-3.04	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG098	-0.0574	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG099	-0.3883	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG100	0.3186	-4.87	-4.24	-3.62	-3.04	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG101	-0.0574	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG102	-0.3883	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG103	0.3186	-4.87	-4.24	-3.62	-3.04	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG104	-0.0574	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG105	-0.3883	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG106	0.3186	-4.87	-4.24	-3.62	-3.04	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG107	-0.0574	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG108	-0.3883	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG109	0.3186	-4.87	-4.24	-3.62	-3.04	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG110	-0.0574	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG111	-0.3883	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG112	0.3186	-4.87	-4.24	-3.62	-3.04	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG113	-0.0574	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG114	-0.3883	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG115	0.3186	-4.87	-4.24	-3.62	-3.04	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG116	-0.0574	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG117	-0.3883	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG118	0.3186	-4.87	-4.24	-3.62	-3.04	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18	-6.18
DG119	-0.0574	-4.48	-4.85	-3.86	-3.28	-6.18	-6.18	-6.18	-6.1																			



# Radiated Composite Gain Data of 2.4GHz

# Appendix A

	191257	314355	362838	267149	-001-172	-3554469	-4193355	-347-374	-3889335	-221055	955139	189217	231236	232127	188131	0361101	-289446	-495473	-452441	-452474	-487462	-3899259	-1797078	029124		
θ(22.5°)	13322	307069	139365	29154	-033-269	-8420494	-3851287	-2681307	-3452939	-181054	054126	161178	18519	201207	220571	097024	3207411	46426	-471482	-523641	-648454	-395073	-1861079	010768		
θ(30°)	-422085	219305	34703	247086	-1591463	-8266532	-3820326	-320354	-393329	-1970165	034097	125127	119121	143175	159181	113015	-209454	-546651	-496679	-741654	-725042	-3191205	-1310482	-062058		
θ(45°)	-232106	07202	276273	182007	-3080686	-81364	85652	478482	-479441	-341133	-1461078	033014	-024044	-027044	125157	1081029	348101	-548052	-496167	-81184	-73527	-3851302	-251227	-2411283		
θ(60°)	-53213	-045114	229246	167163	-3331753	957188	-8081703	-581483	-456141	-3361271	-221171	-121088	-115189	-202091	028083	038092	-291489	-438044	-496679	-741654	-725042	-3191205	-1310482	-062058		
θ(75°)	-53213	-045114	229246	167163	-3331753	957188	-8081703	-581483	-456141	-3361271	-221171	-121088	-115189	-202091	028083	038092	-291489	-438044	-496679	-741654	-725042	-3191205	-1310482	-062058		
θ(90°)	-193138	-386138	-249188	-278164	-9351939	-0801901	-11281986	-8521615	-8891442	-4891442	-4541033	-052126	151013	-158151	010191	034037	-299102	-711164	-736178	6041458	-42415	6121588	-473126	-494181		
θ(105°)	5481	-4321426	-315275	-3351655	-801179	-8951742	-10751556	-1091761	-884154	-363133	-4881889	-4191117	0431177	-4231389	-145014	034038	-330173	-7191592	-4951494	-5231536	-6091796	-6291236	-455117	481194		
θ(120°)	-5341458	4871615	4819495	521173	9571979	-7921728	9121073	9291934	-1113179	4161345	5131758	-477118	-151161	8431463	-18310	0051137	4111689	-7031624	5771675	-7471732	-7031799	-8231715	-819163	-872162		
θ(135°)	5791422	-406167	-7831747	-7841935	-1041935	808188	-11551481	-10521677	-1171904	-451336	5391844	-7971329	-2291447	-9561789	-3361142	-1431294	6571612	-8071632	-581636	-7141631	-7181638	-10391948	-773126	8031746		
θ(150°)	9121689	481616	8159196	16201194	-12319182	-7201737	-102311403	-11318185	-3891321	8171902	416123	-2321025	-1231022	571399	-4021521	-7144167	8391636	-6037151	8391715	8471743	8691786	7991795	-1011132			
θ(165°)	-163212	576175	8121598	-10201184	5981665	-8411132	-11261014	-1210215	4441346	-4861786	864139	-3361381	-1089114	5691458	523173	8031871	-7031546	-5311388	8031717	81616	7341623	656171	951119			
θ(180°)	-1089189	7181720	8651819	814116	8001557	4771558	8391103	8431043	14301184	8721577	814189	7981448	5161845	-1339137	417101	481153	8311566	-587142	523134	6891630	671167	562176	551116	-10331213		
θ(202.5°)	-10961932	450142	-7731784	821181	-7591586	571775	-1351152	-11311055	-13701137	-805166	-6691123	-10581719	7231029	-15811208	-71115	-5174184	8381831	-711556	3981427	478144	514133	-747146	-573162	9471123		
θ(225°)	-10719182	8471784	-7861883	95011044	-8761479	8381824	-11341033	-8821891	-12591138	-7474143	5821902	-771596	-6067181	-118511315	-10291428	866196	-707037	-383113	-3831437	614566	-4871851	-7551855	-476154	-857194		
θ(247.5°)	-11911017	-0741809	-1173127	-1814163	-711678	5420125	-7821979	8241613	-10591541	-11621922	-8711046	-8431687	-897179	8531923	-657167	8551473	-4141351	-3381411	-3891433	-3871635	80126	-747107	-871124			
θ(270°)	-14921032	-9211578	-8961347	-81431	-4211582	-0441613	-6891887	-93911077	-1418151	-121911028	-12211036	-1028111	-115611059	-8681782	-772173	4261537	-501152	-524146	-390139	-479174	-80211368	-149611309	-128411421			
θ(304.5°)	-10341022	-844126	4521408	-4816195	-7571899	-10111137	-11971085	-113211282	-16591456	-14631236	-11641257	-13451105	-11811205	-12361041	-8791778	6320151	-4340188	-4446	-581686	-7241781	-88193	8831011	-10481102	-10561103		
θ(330°)	-10481048	-10451027	9251885	8711187	-131511365	-115511026	-9591599	-105211259	-15691479	-15111483	-145511502	-14741471	-139411216	-10461881	-74443	63201429	3721378	-4261627	-6751626	-07411067	-1213113	-126911248	-10241184	-117311036		
θ(352.5°)	-132611377	-133211276	-12821133	-13511366	-12911081	-9231837	-8281931	-101111168	-13781431	-14311386	-139811366	-136411316	-128111116	-114811071	-9561831	-707161	-816199	-6691784	-6991645	-86511038	-11811281	-137211465	-157811483	-15311391		
θ(375°)	-147511416	-14281131	-128911306	-131011231	-113811088	-105311016	-100611073	-119411249	-133411361	-129811243	-121911185	-120511195	-13411432	-131211166	-105611012	-10111031	-10511022	-9591605	-82711069	-113011281	-146211532	-157511485	-157711597			
θ(405°)	-14811523	-155211458	-141211339	-126811207	-111411081	-103911132	-115411169	-115611109	-110311086	-10611053	-103811078	-112811111	-128911385	-153511534	-145811391	-137311379	-135611293	-12701111	-104811036	-105911092	-122211306	-133511435	-139511445	-152211526		
θ(435°)	2483506Pol	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta		
φ(0°)	9311195	-118187	541318	-1816151	031102	159188	2072124	2302132	206182	959109	-1051246	-408169	-7521671	9321865	-7221516	-31115	4350148	111159	1502108	210215	179128	1532165	179128	05157	-1771131	4791715
φ(15°)	-561721	8791638	-721487	-2781136	840144	199149	182215	2212117	189148	0761236	-171386	6281625	-121273	-1027164	4951281	-1140112	699149	172119	20221	209194	179137	0791099	-1071196	-3361424		
φ(30°)	-278141	5871689	6501359	-1580119	079141	1792136	217027	2312126	199159	0940105	-121284	4341783	-11261357	-1111688	5291247	05019	16513	2402132	2192126	192175	1591729	919142	0161172	-1311199		
φ(45°)	-1184127	3771477	31881168	034168	2592196	3180195	2792126	249213	202165	1080129	0561177	3114179	6571836	-1618681	8391345	0800187	1912137	2452127	2182	171158	141114	1798141	0191111	-2340168		
φ(60°)	023919	-2111325	-3195112	0302134	3279171	3488138	3048	2462125	1591161	1180162	0361046	0571155	-219119	4391682	4371175	0299102	1992134	2282	179173	19118	179147	096142	0340108	-010101		
φ(75°)	010136	-0231117	-0141102	0792143	3403183	3732138	2772134	236179	151121	0889157	0430138	03392	-0071074	-2031376	-429121	0372105	2879191	241118	146148	1732102	214199	154919	0232111	-0309127		
φ(90°)	016398	0201496	-8101106	1192163	3579187	3192195	2372104	1841822	130121	060133	0740183	0889163	0141149	2391142	0429123	343138	2767183	11168	1141	189198	176117	031137	-0490104			
φ(105°)	011305	129125	038019	1893124	42014	3173184	2392129	219185	149115	0740143	0470166	0710176	088018	0161049	-1200117	1218136	4133199	318199	0390129	01138	079113	1110156	-0421128	-153168		
φ(120°)	-0370168	122148	138112	2303138	45172	2819182	1591166	1851132	0940183	076154	079101	0850175	0270121	0310142	-049018	2679138	153012	317118	0740113	-019101	0140148	048011	-1081199	-2271157		
φ(135°)	-0890108	084138	1539132	2303138	3722193	1121107	-010138	0310126	-074074	-0710162	0101069	0760174	0410113	-0200174	230146	38013	0101101	0520132	0160116	0530185	06011	-8021174	-2061164			
φ(150°)	-236117	-0720133	0870172	1102152	3012111	022114	-1191039	-0341101	-1819129	-26801284	32401194	-0861039	-0421023	-0101025	-0340175	1610158	2832123	1180131	0310139	0090	0590102	0891007	-1161212	-2691533		
φ(165°)	-1212119	-2151131	-0610135	0492124	281183	-023123	-2161121	-1181121	-2012129	-314	34201126	-1071168	-211155	-1561146	-2111	1422122	231146	0340101	040135	-038107	-0130136	0150172	-181154	-2491203		
φ(180°)	-1991189	-2041196	-215124	-084156	2579191	0341155	-2841452	-4781449	-5281624	-478127	-174181	-174181	-211182	-1491166	2011	135112	1040103	-081065	01101	-0861102	-040104	0320146	-2861371	-3191215		
φ(202.5°)	-2291135	-114199	-124162	-4150179	0790124	-1381303	-381377	-429147	-441424	-5151552	-4561423	-334132	-0601287	-208124	2821163	-0350113	-0061055	-0970184	-03106	-1861198	-071008	0561206	-4271449	-4761333		
φ(225°)	-3261177	-1721208	2051403	810287	-1101005	-1361287	-395144	-4651449	-3891325	3871149	306124	-3251457	-521415	-313134	3471178	0450104	0281086	-1411138	-1291212	-3561279	-111046	1311332	6047	641119		
φ(247.5°)	-27																									







# Radiated Composite Gain Data of 2.4GHz

# Appendix A

Phi(25)	3.016/4	1.251/49	1.431/21	0.810/37	-1.55/-26	-3.48/-4	4.06/4.53	-5.71/-74	-8.73/-23	5.76/3.18	-1.58/0.37	0.30/58	0.68/0.64	0.48/0.4	0.27/0.3	0.46/1.19	-2.19/-3.4	4.91/6.5	-7.75/8.6	-6.43/-10.22	-10.66/-10.06	8.49/6.67	4.58/3	-1.45/0.32		
(Phi30)	0.911/46	1.87/29	1.97/16	0.8/0.39	-1.87/3.29	3.83/3.77	3.83/4.16	-5.17/10.2	-8.69/-9.8	5.4/3.12	-1.45/0.48	-0.07/1.15	0.24/0.23	0.24/0.18	0.17/0.3	0.24/0.74	-1.54/2.51	3.56/4.47	-5.82/7.5	-8.51/10.3	-10.96/9.24	7.41/5.69	3.94/2.26	0.84/0.3		
(Phi35)	0.04/0.75	1.4/1.71	1.61/1.5	0.19/1.31	-3.24/4.19	-4.87/4.13	3.86/4.16	-5.08/6.79	-6.61/7.51	4.56/3.27	-2.12/1.53	-0.22/0.12	-0.78/0.51	-0.31/0.2	-0.12/0.2	0.56/1.21	-2.08/3.06	3.88/4.48	-5.31/6.78	-6.72/9.78	-8.77/9.09	6.08/5.32	-3.46/3.09	-1.86/0.9		
(Phi40)	-2.65/-1.1	0.14/0.87	1.88/0.63	-0.61/2.61	-5.41/8.2	7.47/5.65	4.78/4.57	-4.89/8.55	-7.37/7.1	6.11/4.71	4.04/3.31	3.94/3.69	-3.17/2.68	-2.01/1.85	-1.32/1.10	-1.29/2.09	-1.33/3.31	4.04/3.21	-4.06/5.62	-7.29/8.68	-6.95/6.51	6.67/7	8.91/2.24	5.38/4.5		
(Phi45)	-0.79/-1.29	-1.24/-0.61	0.88/0.54	-0.53/-2.6	-5.41/8.2	7.47/5.65	4.78/4.57	-4.89/8.55	-7.37/7.1	6.11/4.71	4.04/3.31	3.94/3.69	-3.17/2.68	-2.01/1.85	-1.32/1.10	-1.29/2.09	-1.33/3.31	4.04/3.21	-4.06/5.62	-7.29/8.68	-6.95/6.51	6.67/7	8.91/2.24	5.38/4.5		
(Phi50)	4.67/1.87	5.9/3.34	2.3/1.7	2.38/4.05	-5.88/-7.57	8.99/9.99	9.97/9.14	8.48/8.52	8.77/9.24	6.12/4.08	3.99/4.35	4.49/3.34	-3.27/3.08	-3.39/3.83	-3.12/3.21	1.65/1.52	-2.21/2.6	2.73/3.12	4.88/7.1	9.36/7.69	6.61/7.37	-3.39/3.10	-10.09/10.1	-10.46/10.3		
(Phi55)	-4.99/-3.4	-7.01/-7.17	-4.49/-5.99	-6.89/9.25	-10.50/-10.71	-11.14/9.6	-8.29/8.67	-7.34/8.22	-6.36/6.41	-5.22/5.34	-2.78/3.08	4.04/4.35	-3.53/2.25	-1.29/1.35	-2.72/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43	
(Phi60)	4.32/6.89	6.49/6.78	6.56/6.43	7.65/10.07	-11.59/11.51	-11.01/11.01	13.10/18.1	-14.89/10.83	-9.59/8.31	6.94/6.67	8.03/8.39	-7.85/5.63	-4.78/8.69	6.88/3.84	-2.24/2.3	-4.03/6.12	6.09/4.39	3.88/4.28	4.98/5.23	6.09/6.84	-11.03/9.19	11.63/9.19	8.11/7.33	-8.41/10.2	-12.12/10.6	
(Phi65)	7.49/5.75	6.22/6.51	-18.49/15.78	-14.81/15.55	-12.72/12.68	-10.83/14.89	-16.23/16.78	-12.65/11.04	-12.28/12.09	9.41/9.89	-19.49/13.57	6.89/6.16	-5.54/7.35	-11.70/11.52	4.99/6.41	4.88/4.8	6.83/7.32	7.47/8.3	4.31/5.39	-7.02/6.45	47/45	9.94/9.84	4.51/5.33	-11.19/9.86		
(Phi70)	15.98/9.79	7.52/10.31	16.53/16.99	16.81/17.95	15.52/17.29	-11.45/10.98	-11.42/10.92	-16.25/10.83	-14.29/11.18	9.55/9.32	11.3/12.12	-1.61/5.59	-17.15/15.1	-16.47/14.4	-12.33/10.81	6.07/6.85	9.18/7.91	5.77/3.96	4.24/4.15	6.74/6.18	4.52/4.52	6.33/5.58	6.33/5.58	6.33/5.58		
(Phi75)	17.88/16.71	-11.58/12.59	-19.02/18.88	-18.47/19.84	-16.23/19.16	9.32/8.12	8.07/10.2	-15.07/10.98	-19.14/12.1	11.53/11.39	-13.44/11.59	9.16/8.64	-8.29/11.7	-16.47/15.15	-15.23/15.12	8.79/8.48	5.24/4.63	-4.58/3.92	-4.48/4.26	4.33/4.47	-4.27/4.39	4.78/4.39	4.27/4.39	4.27/4.39		
(Phi80)	-15.52/19.27	-12.71/11.59	-15.15/18.86	-12.16/16.96	-13.04/10.06	-13.31/11.78	-14.51/18.17	-15.74/14.56	-15.41/14.56	13.51/12.39	-13.41/18.08	-12.04/13.59	-14.14/12.39	-10.97/14.13	-11.02/9.87	8.84/8.64	-7.97/9.59	3.16/3.96	4.54/4.41	-4.44/2.25	4.44/2.25	4.44/2.25	4.44/2.25	4.44/2.25		
(Phi85)	-17.65/19.13	-18.38/16.98	-17.69/17.95	-16.76/15.51	-13.84/11.42	-10.31/10.88	-12.71/15.22	-16.65/18.98	-15.86/14.56	-12.94/9.47	8.3/9.32	-10.54/11.1	-11.51/9.11	-12.71/12.32	-18.11/9.82	-14.26/8.46	6.01/6.84	2.11/1.22	-1.79/3.21	5.96/6.67	5.28/5.54	6.72/7.52	3.96/3.3	6.61/6.02		
(Phi90)	-17.12/19.3	-11.79/10.58	-10.58/11.21	-11.42/11.07	-11.42/11.07	-16.6/18.43	-17.09/18.73	-17.59/15.16	-14.86/18.77	-17.58/16.55	-12.07/10.38	9.17/9.7	-10.72/12.36	-13.89/13.52	-11.4/8.84	-7.88/8.08	4.66/3.78	-3.23/3.19	3.96/3.53	-1.61/3.78	3.69/4.36	4.72/5.83	8.11/7.1	9.89/7.05		
(Phi95)	-14.15/14.5	-11.81/10.8	-10.79/10.71	-8.75/10.92	-10.37/9.82	-10.18/11.47	-13.66/17.42	-19.7/17.4	-19.12/17.79	-16.81/14.56	-15.16/13.1	-17.14/17.98	-18.24/19.67	-18.14/15.69	-13.59/12.22	-10.98/9.15	-1.76/5.75	4.58/3.97	-3.54/3.81	-3.98/4.43	-3.88/4.63	-1.02/10.52	-16.23/13.83	-13.16/16.52		
(Phi100)	-13.86/10.85	-16.54/10.63	-12.23/10.63	-10.86/11.82	-13.71/14.36	-15.49/18.11	-19.26/17.88	-18.39/18.06	-18.68/17.68	-17.13/15.52	-14.71/15.65	-16.34/19.21	-17.34/17.96	-19.23/15.65	-12.98/10.64	-8.61/6.7	5.28/4.51	-0.04/0.02	-4.67/5.78	6.99/6.84	-10.97/12.58	-11.64/10.48	-10.12/10.57	-13.07/10.93		
(Phi105)	-14.52/15.1	-18.62/17.63	-18.84/15.51	-14.06/13.87	-14.48/15.23	-16.49/17.29	-17.34/17.22	-17.34/17.22	-18.23/17.38	-17.79/16.86	-16.91/17.11	-17.07/16.16	-15.73/14.14	-11.38/9.81	-8.67/7.73	6.11/5.88	5.53/5.69	6.25/5.51	6.46/11.18	-12.45/11.13	-16.64/17.12	-15.56/13.82	-11.93/11.22	-11.84/11.28		
(Phi110)	-15.46/15.45	-16.15/16.15	-15.77/15.44	-15.01/14.95	-15.08/15.81	-16.11/16.26	-16.81/17.98	-18.44/18.27	-17.08/16.83	-16.59/15.68	-15.59/15.48	-15.13/15.19	-14.71/15.13	-10.58/9.78	8.91/8.38	8.56/8.36	-10.98/11.36	-15.99/15.21	-14.14/14.48	-16.66/17.17	-17.18/18.19	-16.24/18.17	-17.83/15.63	-17.83/15.63		
(Phi115)	-17.88/18.61	-16.00/16.51	-14.14/14.66	-14.24/14.68	-15.10/16.88	-16.25/16.88	-17.57/18.13	-18.94/16.36	-15.19/14.52	-12.79/12.12	-12.53/12.11	-13.28/14.06	-15.16/16.21	-11.90/11.41	-14.14/14.14	-14.14/14.14	-14.14/14.14	-14.14/14.14	-14.14/14.14	-14.14/14.14	-14.14/14.14	-14.14/14.14	-14.14/14.14	-14.14/14.14		
(Phi120)	-18.01/18.7	-18.01/18.7	-15.14/14.43	-13.18/12.98	-12.33/12.16	-12.51/12.89	-12.71/12.15	-11.51/11.31	-11.20/11.59	-10.65/10.96	-11.12/11.43	-13.15/14.29	-17.51/18.49	-17.51/18.49	-18.06/18.45	-17.44/17.15	-17.77/16.17	-15.91/15.15	-10.48/9.13	-10.31/10.39	-12.91/14.28	-15.29/10.62	-17.16/18.17	-17.86/18.16		
PhiGain	2.4835/Phi2 <td>Theta/1<td colspan="24"></td> </td>	Theta/1 <td colspan="24"></td>																								
Phi(25)	0.911/46	1.87/29	1.97/16	0.8/0.39	-1.87/3.29	3.83/3.77	3.83/4.16	-5.17/10.2	-8.69/-9.8	5.4/3.12	-1.45/0.48	-0.07/1.15	0.24/0.23	0.24/0.18	0.17/0.3	0.24/0.74	-1.54/2.51	3.56/4.47	-5.82/7.5	-8.51/10.3	-10.96/9.24	7.41/5.69	3.94/2.26	0.84/0.3		
(Phi30)	0.04/0.75	1.4/1.71	1.61/1.5	0.19/1.31	-3.24/4.19	-4.87/4.13	3.86/4.16	-5.08/6.79	-6.61/7.51	4.56/3.27	-2.12/1.53	-0.22/0.12	-0.78/0.51	-0.31/0.2	-0.12/0.2	0.56/1.21	-2.08/3.06	3.88/4.48	-5.31/6.78	-6.72/9.78	-8.77/9.09	6.08/5.32	-3.46/3.09	-1.86/0.9		
(Phi35)	-2.65/-1.1	0.14/0.87	1.88/0.63	-0.61/2.61	-5.41/8.2	7.47/5.65	4.78/4.57	-4.89/8.55	-7.37/7.1	6.11/4.71	4.04/3.31	3.94/3.69	-3.17/2.68	-2.01/1.85	-1.32/1.10	-1.29/2.09	-1.33/3.31	4.04/3.21	-4.06/5.62	-7.29/8.68	-6.95/6.51	6.67/7	8.91/2.24	5.38/4.5		
(Phi40)	-0.79/-1.29	-1.24/-0.61	0.88/0.54	-0.53/-2.6	-5.41/8.2	7.47/5.65	4.78/4.57	-4.89/8.55	-7.37/7.1	6.11/4.71	4.04/3.31	3.94/3.69	-3.17/2.68	-2.01/1.85	-1.32/1.10	-1.29/2.09	-1.33/3.31	4.04/3.21	-4.06/5.62	-7.29/8.68	-6.95/6.51	6.67/7	8.91/2.24	5.38/4.5		
(Phi45)	4.67/1.87	5.9/3.34	2.3/1.7	2.38/4.05	-5.88/-7.57	8.99/9.99	9.97/9.14	8.48/8.52	8.77/9.24	6.12/4.08	3.99/4.35	4.49/3.34	-3.27/3.08	-3.39/3.83	-3.12/3.21	1.65/1.52	-2.21/2.6	2.73/3.12	4.88/7.1	9.36/7.69	6.61/7.37	-3.39/3.10	-10.09/10.1	-10.46/10.3		
(Phi50)	-4.99/-3.4	-7.01/-7.17	-4.49/-5.99	-6.89/9.25	-10.50/-10.71	-11.14/9.6	-8.29/8.67	-7.34/8.22	-6.36/6.41	-5.22/5.34	-2.78/3.08	4.04/4.35	-3.53/2.25	-1.29/1.35	-2.72/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43	-2.71/2.43		
(Phi55)	4.32/6.89	6.49/6.78	6.56/6.43	7.65/10.07	-11.59/11.51	-11.01/11.01	13.10/18.1	-14.89/10.83	-9.59/8.31	6.94/6.67	8.03/8.39	-7.85/5.63	-4.78/8.69	6.88/3.84	-2.24/2.3	-4.03/6.12	6.09/4.39	3.88/4.28	4.98/5.23	6.09/6.84	-11.03/9.19	11.63/9.19	8.11/7.33	-8.41/10.2	-12.12/10.6	
(Phi60)	7.49/5.75	6.22/6.51	-18.49/15.78	-14.81/15.55	-12.72/12.68	-10.83/14.89	-16.23/16.78	-12.65/11.04	-12.28/12.09	9.41/9.89	-19.49/13.57	6.89/6.16	-5.54/7.35	-11.70/11.52	4.99/6.41	4.88/4.8	6.83/7.32	7.47/8.3	4.31/5.39	-7.02/6.45	47/45	9.94/9.84	4.51/5.33	-11.19/9.86		
(Phi65)	15.98/9.79	7.52/10.31	16.53/16.99	16.81/17.95	15.52/17.29	-11.45/10.98	-11.42/10.92	-16.25/10.83	-14.29/11.18	9.55/9.32	11.3/12.12	-1.61/5.59	-17.15/15.1	-16.47/14.4	-12.33/10.81	6.07/6.85	9.18/7.91	5.77/3.96	4.24/4.15	6.74/6.18	4.52/4.52	6.33/5.58	6.33/5.58	6.33/5.58		
(Phi70)	17.88/16.71	-11.58/12.59	-19.02/18.88	-18.47/19.84	-16.23/19.16	9.32/8.12	8.07/10.2	-15.07/10.98	-19.14/12.1	11.53/11.39	-13.44/11.59	9.16/8.64	-8.29/11.7	-16.47/15.15	-15.23/15.12	8.79/8.48	5.24/4.63	-4.58/3.92	-4.48/4.26	4.33/4.47	-4.27/4.39	4.78/4.39	4.27/4.39	4.27/4.39		
(Phi75)	-15.52/19.27	-12.71/11.59	-15.15/18.86	-12.16/16.96	-13.04/10.06	-13.31/11.78	-14.51/18.17	-15.74/14.56	-15.41/14.56	13.51/12.39	-13.41/18.08	-12.04/13.59	-14.14/12.39	-10.97/14.13	-11.02/9.87	8.84/8.64	-7.97/9.59	3.16/3.96	4.54/4.41	-4.44/2.25	4.44/2.25	4.44/2.25	4.44/2.25	4.44/2.25		
(Phi80)	-17.65/19.13	-18.38/16.98	-17.69/17.95	-16.76/15.51	-13.84/11.42	-10.31/10.88	-12.71/15.22	-16.65/18.98	-15.86/14.56	-12.94/9.47	8.3/9.32	-10.54/11.1	-11.51/9.11	-12.71/12.32	-18.11/9.82	-14.26/8.46	6.01/6.84	2.11/1.22	-1.79/3.21	5.96/6.67	5.28/5.54	6.72/7.52	3.96/3.3	6.61/6.02		
(Phi85)	-17.12/19.3	-11.79/10.58	-10.58/11.21	-11.42/11.07	-11.42/11.07	-16.6/18.43	-17.09/18.73	-17.59/15.16	-14.86/18.77	-17.58/16.55	-12.07/10.38	9.17/9.7	-10.72/12.36	-13.89/13.52	-11.4/8.84	-7.88/8.08	4.66/3.78	-3.23/3.19	3.96/3.53	-1.61/3.78	3.69/4.36	4.72/5.83	8.11/7.1	9.89/7.05		
(Phi90)	-14.15/14.5	-11.81/10.8	-10.79/10.71	-8.75/10.92</																						





## Radiated Composite Gain Data of 5GHz

## Appendix B

Freq(Hz)	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	5.55	5.98	5.87	5.49
Ant. 2 Max Gain (dBi)	5.48	5.41	4.88	4.65
Ant. 1 Polarization/ $\theta(^{\circ})/\phi(^{\circ})$	Theta/67.5/322.5	Theta/82.5/307.5	Theta/60/315	Theta/67.5/322.5
Ant. 2 Polarization/ $\theta(^{\circ})/\phi(^{\circ})$	Theta/60/210	Theta/60/210	Theta/60/202.5	Theta/45/232.5
Max Gain (dBi)	5.55	5.98	5.87	5.49
DG [1SS] (dBi)	6.77	7	7.46	6.35
DG [2SS] (dBi)	5.55	5.98	5.87	5.49









# Radiated Composite Gain Data of 5GHz

# Appendix B

Phi(2D)	4.30E-03	4.93E-03	3.91E-03	5.65E-03	3.59E-03	3.14E-03	2.95E-03	3.91E-03	5.65E-03	4.46E-03	4.21E-03	4.19E-04	-1.13E-02	-14.86E-05	-12.37E-04	0.07E-07	-1.02E-08	-1.99E-08	-1.32E-05	4.23E-07	6.03E-04	4.89E-04	2.61E-04	-1.11E-04
(Phi)2D	-4.21E-03	-13.99E-02	6.44E-13	8.14E-33	3.22E-75	2.89E-23	1.56E-27	3.49E-03	7.89E-43	6.04E-27	3.06E-21	3.41E-06	-1.107E-17	-1.37E-12	-1.68E-07	9.99E-12	2.74E-57	4.02E-10	-1.42E-78	-3.98E-19	2.66E-39	3.75E-59	3.68E-32	2.07E-24
(Phi)3D	0.916138	18.73E-02	9.57E-11	6.54E-31	3.19E-31	2.36E-03	4.94E-27	5.33E-08	6.67E-78	4.86E-54	4.55E-32	3.07E-15	-10.18E-62	6.34E-47	1.06E-17	1.36E-11	1.69E-69	4.50E-24	4.19E-57	3.61E-26	6.06E-24	6.61E-12	4.97E-12	-1.72E-11
(Phi)4D	4.56E-13	18.12E-06	9.76E-15	8.14E-88	4.61E-88	2.21E-04	0.87E-14	-2.63E-35	5.59E-82	7.99E-84	3.14E-19	8.07E-29	-8.79E-12	-13.27E-29	8.83E-12	-1.76E-19	-1.87E-12	5.49E-23	3.51E-47	-1.59E-22	2.81E-02	4.2E-72	1.21E-11	3.56E-11
(Phi)5D	4.54E-13	12.67E-03	6.83E-05	8.19E-39	7.32E-63	5.29E-29	2.33E-14	1.64E-30	7.70E-65	4.64E-30	4.54E-19	1.19E-18	-1.76E-16	-1.52E-12	-1.51E-12	-1.81E-14	-1.48E-12	5.84E-51	5.06E-86	5.62E-40	7.03E-13	1.03E-13	6.57E-31	2.54E-17
(Phi)6D	2.57E-67	-1.13E-16	4.87E-61	9.32E-87	9.96E-87	8.88E-76	3.54E-16	2.13E-43	7.36E-10	7.89E-53	4.93E-57	7.78E-14	-1.663E-05	6.84E-15	-1.91E-10	-1.83E-14	-1.33E-14	8.3E-23	6.24E-33	6.63E-29	8.83E-76	5.54E-12	-8.82E-45	6.07E-38
(Phi)7D	2.26E-67	9.96E-12	4.28E-79	-13.31E-11	13.29E-11	-14.19E-11	4.87E-54	4.59E-42	6.52E-10	9.06E-74	6.27E-56	-7.47E-13	-1.869E-07	5.64E-24	-12.41E-16	-1.199E-10	-4.37E-13	-9.32E-05	6.38E-07	4.37E-37	7.08E-36	5.79E-92	4.99E-86	7.87E-17
(Phi)8D	2.59E-61	10.78E-12	-12.5E-10	-17.58E-15	-17.08E-13	-17.54E-09	-11.42E-92	6.91E-24	-13.16E-10	-10.02E-16	6.73E-01	-19.23E-13	5.49E-12	7.88E-14	-12.38E-15	-17.62E-19	-11.14E-14	7.40E-17	-1.14E-12	3.90E-27	1.09E-23	3.66E-65	-10.88E-11	-1.13E-16
(Phi)9D	1.43E-8	-14.61E-17	-18.22E-10	19.44E-13	18.48E-13	-14.7E-19	11.73E-72	8.04E-7	7.18E-24	-18.29E-42	-18.12E-42	38E-26	-18.91E-65	6.06E-11	7.18E-56	-10.06E-14	-17.74E-38	-18.22E-36	9.69E-47	3.30E-36	1.85E-19	4.75E-29	-10.64E-36	-12.69E-61
(Phi)10D	5.53E-10	18.46E-13	-18.46E-13	-17.48E-18	-19.24E-13	-17.17E-14	-18.76E-19	-18.07E-19	-18.33E-12	-18.38E-12	8.71E-29	-17.72E-31	-7.48E-11	8.12E-13	-10.44E-10	-10.89E-10	-17.17E-13	-15.48E-14	1.83E-48	1.83E-48	1.83E-48	1.83E-48	1.83E-48	1.83E-48
(Phi)11D	2.61E-18	18.57E-37	-19.24E-13	-18.29E-15	-18.01E-18	-17.98E-18	-17.91E-37	-17.91E-37	-17.91E-37	-17.91E-37	8.71E-38	-17.91E-37	-17.91E-37	-17.91E-37	-17.91E-37	-17.91E-37	-17.91E-37	-17.91E-37	-17.91E-37	-17.91E-37	-17.91E-37	-17.91E-37	-17.91E-37	-17.91E-37
(Phi)12D	12.26E-11	17.44E-12	16.51E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12	-18.73E-12
(Phi)13D	1.75E-14	12.41E-13	-18.68E-13	-17.47E-13	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14	-18.07E-14
(Phi)14D	17.85E-14	13.94E-14	-18.73E-16	-18.21E-14	-18.45E-15	-18.67E-19	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15	-17.76E-15
(Phi)15D	-14.38E-17	13.93E-10	-18.27E-15	-18.27E-15	-17.77E-15	-18.19E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15	-18.27E-15
(Phi)16D	-10.42E-16	15.62E-12	-18.98E-14	-19.12E-12	-15.69E-14	-14.38E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13	-17.34E-13
(Phi)17D	-13.46E-16	-18.91E-08	-15.25E-13	-18.44E-10	-12.04E-13	-15.22E-15	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17	-15.85E-17
(Phi)18D	-19.10E-18	-16.09E-14	-18.42E-19	-18.42E-19	-12.07E-16	-13.84E-13	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19	-18.42E-19
(Phi)19D	-17.07E-13	-19.43E-18	-18.19E-14	-18.06E-19	-19.24E-16	-15.19E-16	-17.41E-17	-18.17E-12	-18.17E-12	-18.17E-12	-18.17E-12	-18.17E-12	-18.17E-12	-18.17E-12	-18.17E-12	-18.17E-12	-18.17E-12	-18.17E-12	-18.17E-12	-18.17E-12	-18.17E-12	-18.17E-12	-18.17E-12	-18.17E-12
(Phi)20D	-15.37E-16	-18.52E-17	-19.14E-16	-18.75E-16	-18.59E-17	-18.71E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12	-18.11E-12
(Phi)21D	-11.86E-13	-16.02E-15	-1.74E-13	-12.63E-13	-10.03E-16	6.85E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14	-12.25E-14
(Phi)22D	-11.81E-14	-12.13E-03	-9.34E-05	-19.56E-8	8.99E-14	-13.58E-16	-16.24E-16	-17.51E-17	-17.51E-17	-17.51E-17	-17.51E-17	-17.51E-17	-17.51E-17	-17.51E-17	-17.51E-17	-17.51E-17	-17.51E-17	-17.51E-17	-17.51E-17	-17.51E-17	-17.51E-17	-17.51E-17	-17.51E-17	-17.51E-17
FreeData	5.65E-04	Theta=1																						
Phi	(Phi)1D	(Phi)2D	(Phi)3D	(Phi)4D	(Phi)5D	(Phi)6D	(Phi)7D	(Phi)8D	(Phi)9D	(Phi)10D	(Phi)11D	(Phi)12D	(Phi)13D	(Phi)14D	(Phi)15D	(Phi)16D	(Phi)17D	(Phi)18D	(Phi)19D	(Phi)20D	(Phi)21D	(Phi)22D	(Phi)23D	(Phi)24D
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94
Phi	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0										





# Radiated Composite Gain Data of 5GHz

# Appendix B

(H12)	-1.6881-17.4	-1.6368-18.88	-1.2298-12.11	-1.3303-18.87	-1.45-12.24	-1.448-13.76	-1.3886-18.36	-1.8449-8.45	-2.38-0.84	-1.643-3.51	-8.44-12.27	-1.0526-2.68	-7.115-8.48	-6.75-6.41	-4.32-0.65	-1.588-13.71	-1.65-13.51	-1.121-14.78	-1.844-12.68	-1.469-7.84	-6.33-8.48	-6.22-7.71	-6.78-8.11	-7.69-7.76	
(H8.5)	8.911-10.8	-1.642-17.85	-1.13-15.36	-1.47-16.54	-1.47-15.87	-1.82-17.78	-1.65-18.72	-1.29-8.88	-2.41-4.17	2.39-3.27	-10.46-13.74	3.99-8.83	-10.32-7.24	-8.48-8.58	5.99-12.22	-17.11-19.23	-1.876-13.77	-1.833-18.65	-1.77-11.65	-1.43-7.71	6.62-7.79	8.88-1.18	-11.04-15.35	6.41-7.71	
(H12.5)	-1.22-15.12	-1.688-17.56	-1.416-17.65	-1.508-14.42	-1.306-14.47	-1.78-17.76	-1.62-18.74	-1.97-18.13	-1.79-10.75	-4.39-2.77	-10.22-14.63	-11.07-9.92	-14.31-11.12	-17.79-11.62	7.99-13.52	-14.58-18.59	-17.41-17.41	-13.86-19.11	-1.66-10.87	-11.4-7.77	-10.10-12.39	8.03-8.88	-11.06-12.42	-11.91-11.67	
(H9.5)	-1.24-15.61	-1.758-13.82	-1.386-18.38	-1.41-17.12	-1.321-17.87	-1.81-17.76	-1.93-18	-1.87-14.11	-6.09-3.89	6.31-7.08	-11.25-13.55	-12.41-11.49	-17.88-10.48	9.26-15.33	-11.48-18.13	-13.79-18.11	-13.79-18.89	-16.79-17.65	-12.87-12.55	-11.41-11.7	-11.43-10.46	7.53-10.37	-13.44-13.77	-13.37-11.41	
(H10)	-1.88-17.71	-1.857-12.56	-1.536-18.95	-1.27-17.01	-1.25-18.17	-1.76-17.76	-1.93-18.14	-1.75-18.57	-1.02-6.08	-7.11-8.24	-11.76-11.24	-11.48-11.77	-18.51-11.77	-18.51-11.77	-14.89-18.24	-17.17-18.95	-18.91-19.26	-16.89-18.78	-15.81-11.47	9.4-12.95	5.98-6.96	-11.43-10.76	-14.88-17.78		
(H12.5)	-1.736-18.25	-1.56-13.37	-1.616-19.07	-1.09-9.24	-1.01-17.68	-1.67-18.78	-1.86-18.47	-1.96-17.78	-1.80-17.8	6.54-7.95	8.82-13.48	-10.66-14.26	-17.81-15.59	-15.41-14.78	-11.36-17.56	-18.47-18	-12.94-18.18	-13.83-13.29	-16.48-11.76	-11.81-10.37	-10.42-15.87	-6.59-8.37	-11.78-13.91	-13.76-18.96	
(H12)	-1.08-18.16	-1.69-13.19	-1.637-11.12	-7.84-9.75	-12.41-11.75	-1.04-17.88	-1.78-18.43	-1.66-16.12	-12.89-10.29	-11.87-10.27	-12.12-14.86	-10.68-14.95	-13.88-10.28	-18.26-14.21	1.06-10.76	-18.36-18.63	-15.31-17.32	-11.92-11.81	8.99-16.42	-15.08-10.62	-4.53-6.33	-15.23-13.53	-1.48-11.6	-13.76-18.96	
(H12.5)	-1.938-15.34	-1.942-19.22	-1.81-13.11	8.88-8.3	-12.61-12.58	8.57-11.11	-11.47-12.95	-17.62-15.11	-17.41-16.93	-18.06-13.01	-13.12-14.54	-11.85-13.89	-18.79-18.66	-18.84-18.69	-18.79-10.67	-15-16.89	-18.59-17.78	-12.84-11.61	-11.38-15.1	-11.57-13.39	-12.78-19.78	-11.24-11.4	-13.34-17.78	-14.76-17.95	
(H12.5)	-1.938-17.21	-1.856-15.42	-1.523-11.93	8.87-8.21	9.19-11.77	-18.88-16.67	9.23-8.01	-11.07-16.23	-13.85-18.34	-13.09-11.85	-14.57-14.24	-13.56-13.11	-17.71-13.2	-18.08-18.79	-18.48-14.7	-16.81-8.35	-18.12-16.28	-11.97-11.95	-11.37-8.21	-11.59-11.18	-11.52-11.18	-18.54-17.77	-18.01-18.07	-18.72-17.48	
(H12.5)	-1.868-18.77	-1.928-18.08	-1.938-13.88	-10.75-11.38	-12.51-8.97	-7.37-10.17	8.89-8.95	-10.90-8.9	-13.51-11.26	9.95-12.41	-1.98-17.3	-11.88-13.53	-17.96-16.53	-17.29-16.2	-17.88-15.31	-11.57-10.26	-14.07-19.57	-12.91-12.76	-11.83-14.7	-11.08-13.62	-18.88-13.56	-17.87-18.76	-18.73-18.76	-18.56-17.54	
(H12.5)	-1.32-18.27	-1.842-18.13	-1.641-17.18	-1.856-18.11	-11.81-11.77	9.23-8.96	-13.31-14.66	-14.24-16.46	-18.10-14.43	-13.63-14.24	-16.07-16.08	-12.11-16.17	-17.89-18.41	-18.10-18.81	-17.71-18.13	-14.25-10.98	-10.65-15.31	-17.24-15.27	-11.10-13.13	-10.65-12.83	-18.63-18.93	-18.73-18.87	-17.45-17.73		
(H12.5)	-1.789-19.16	-1.37-15.55	-1.689-18.74	-1.868-13.08	-10.19-8.42	8.53-10.27	-12.28-18.44	-18.24-16.78	-17.26-17.14	-17.17-18.96	-18.36-18.69	-18.29-17.67	-16.56-15.61	-17.21-17.87	-18.37-19	-14.79-15.83	-11.41-18.39	8.51-11.31	-16.59-18.02	-14.07-11.41	-10.11-10.55	-13.89-18.83	-18.12-17.93	-18.16-18.94	
(H12.5)	-1.94-19.71	-1.748-18.84	-1.824-16.46	-12.76-10.94	-10.71-10.37	-11.11-13.13	-13.74-11.78	-15.45-14.49	-14.5-14.49	-15.23-16.16	-17.9-18.46	-15.2-18.12	-18.74-18.17	-15.74-14.16	-13.55-14.14	-17.63-18.61	-17.93-19.18	-17.36-18.71	-12.48-10.16	-11.77-11.78	-11.78-11.28	-13.62-13.97	-13.51-13.78		
(H12.5)	-1.97-17.65	-1.932-18.25	-1.885-17.07	-14.34-12.97	-13.35-14.89	-15.28-15.84	-15.57-16.41	-16.14-18.72	-18.29-17.81	-17.44-18.71	-18.57-18.92	-17.76-18.06	-18.26-18.08	-18.84-18.45	-18.16-18.75	-14.76-13.51	-12.86-13.2	-13.47-13.63	-13.54-13.12	-12.21-14.1	-11.79-12.07	-12.73-13.73	-15.72-16.33	-15.33-15.73	
FreeNo	2.076E4	ThetaA=2																							
Gain	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)	(H12.5)
(H12.5)	-1.883-18.72	-1.629-13.92	-1.436-22.35	-3.65-22.89	2.28-11.89	-1.46-13.51	-1.51-11.84	-2.14-21.61	3.01-31.61	4.67-51.96	-7.81-97.77	-11.24-11.78	-11.50-10.41	-8.97-7.77	-7.04-6.51	-5.98-4.93	-4.63-4.2	-3.86-3.89	4.00-4.25	4.86-5.54	4.51-4.29	-1.75-13.13	-1.45-15.75		
(H12.5)	-1.106-12.22	-1.228-11.08	-1.041-9.58	-8.79-7.8	6.9-6.52	6.54-6.4	4.24-4.07	-4.14-7.2	-5.17-5.73	6.69-6.83	-11.15-16.89	-11.63-11.42	-10.88-12.47	3.54-4.07	3.38-2.83	-2.08-1.53	-1.22-0.95	0.71-0.81	-1.06-1.46	-1.95-2.32	2.71-3.59	-4.85-6.64	6.98-8.81		
(H12.5)	-1.28-12.35	-1.271-11.54	-1.083-11.28	-1.184-11.28	-1.154-11.21	6.53-7.44	7.77-7.47	-4.07-3.99	-4.07-3.99	6.79-6.68	7.09-7.02	6.91-6.64	-10.81-12.44	5.91-4.57	-3.71-3.2	-1.21-0.6	2.24-0.74	1.72-1.56	0.02-0.64	1.99-1.49	5.48-5.58	-1.62-1.6	-2.71-2.6	-2.68-2.61	
(H12.5)	-4.04-1.9	-4.23-4.3	-4.44-4.9	-6.17-7.88	-8.76-8.59	8.15-7.22	5.84-4.41	3.22-2.34	2.29-2.7	3.17-3.13	3.13-3.43	-4.46-4.59	-7.04-7.07	-6.0-4.62	3.88-3.16	2.59-1.69	-0.89-0.35	0.14-0.52	0.76-0.44	0.02-0.81	-1.38-1.59	-1.8-2.15	2.71-3.2	-3.74-4.1	
(H12.5)	-2.94-3.2	-3.42-3.48	-3.15-2.83	-3.11-3.21	-3.36-3.46	3.77-4.61	4.92-4.13	3.09-2.49	2.73-2.78	3.79-4.61	2.85-2.02	2.85-2.02	2.85-2.02	2.85-2.02	2.85-2.02	2.85-2.02	2.85-2.02	2.85-2.02	2.85-2.02	2.85-2.02	2.85-2.02	2.85-2.02	2.85-2.02	2.85-2.02	
(H12.5)	-3.99-2.68	-1.86-2.5	3.61-3.81	-3.21-2.5	-1.91-1.72	1.86-2.3	3.52-3.02	-1.95-1.38	-1.10-1.47	0.01-0.41	2.2-1.7	-2.47-1.9	0.17-0.25	3.693-3.4	3.12-3.21	1.79-1.19	0.84-0.42	-0.37-1.11	-0.90-0.48	0.61-0.68	1.01-0.68	1.79-1.64	0.21-1.68	-2.83-3.2	
(H12.5)	-2.77-6.99	0.23-0.03	0.48-1.5	2.01-2	2.96-2.65	3.34-3.41	2.18-1.07	0.09-1.3	1.69-1.61	2.19-2.38	6.71-6.15	0.41-1.47	4.91-4.2	2.86-2.62	4.47-4.16	2.89-2.7	0.26-0.46	-0.04-1.51	-0.76-0.57	0.0-0.91	0.26-0.47	0.95-1.1	-1.11-1.87	0.93-0.92	
(H12.5)	-4.79-3.96	-1.98-0.85	6.99-3.35	6.88-0.74	-15.23-2.3	-14.9-3.47	-13.93-2.4	0.12-1.93	2.92-3.8	4.11-4.2	2.41-1.78	1.1-0.44	-0.24-0.03	1.884-2.7	5.84-2.23	1.81-3.1	3.33-0.99	-0.77-0.39	0.3-0.7	-0.73-0.24	0.89-0.42	-6.72-1.3	-1.73-3.94		
(H12.5)	-1.67-0.91	3.41-0.27	6.02-0.76	6.03-0.67	-1.23-3.73	9.21-8.3	1.81-1.02	-1.99-2.88	4.82-4.48	5.42-5.09	3.26-2.07	1.99-1.77	0.84-0.65	1.49-2.3	5.49-3.23	1.21-1.33	3.38-2.22	3.77-0.77	1.22-1.92	0.69-1.04	1.69-0.55	3.68-1.71	3.28-1.51	3.88-1.51	
(H12.5)	6.87-1.71	6.87-1.97	6.39-1.42	6.87-1.34	6.87-1.16	10.84-8.4	6.87-1.16	10.84-8.4	6.87-1.16	10.84-8.4	6.87-1.16	10.84-8.4	6.87-1.16	10.84-8.4	6.87-1.16	10.84-8.4	6.87-1.16	10.84-8.4	6.87-1.16	10.84-8.4	6.87-1.16	10.84-8.4	6.87-1.16	10.84-8.4	
(H12.5)	4.69-5.42	5.22-10.16	1.21-23.34	-3.32-17.47	2.61-6.87	-17.79-11.57	-5.34-5.05	-3.81-8.3	4.00-2.27	4.32-3.94	3.75-3.08	0.44-0.83	2.13-1.05	0.87-1.52	2.17-0.81	1.72-1.07	0.27-1.07	-1.43-1.28	-1.89-1.35	-4.21-3.75	-1.59-0.49	0.87-1.17	0.49-0.43	0.56-0.37	
(H12.5)	4.03-4.24	4.01-2.27	2.67-4.41	5.29-2.59	2.81-7.68	-17.77-12.88	7.27-5.29	3.99-6.11	2.92-2.37	3.01-2.96	-7.12-6.13	-12.47-10.27	1.24-2.07	3.17-2.83	2.47-0.94	8.1-31	2.87-0.94	-8.1-31	-2.89-1.25	5.94-5.08	-1.02-0.87	0.41-1.14	-1.28-0.44	-5.87-3	
(H12.5)	3.75-4.41	4.3-1.2	2.76-4.59	6.37-3.77	4.02-8.63	3.82-12.08	6.53-9.58	7.98-6.9	8.36-10.2	0.16-7.5	0.69-6.73	3.98-1.66	2.83-2.56	-1.83-5.6	2.94-5.1	0.98-7.3	1.13-1.89	-3.21-9.97	3.98-3.78	8.92-8.76	-1.31-1.68	2.78-2.56	-3.01-7.01	0.95-1.6	
(H12.5)	8.93-6.91	4.86-2.32	3.32-4.66	6.21-4.39	5.84-11.99	-18.27-10.54	8.70-12.97	9.39-2.47	4.1-4.93	3.75-5.91	3.25-5.99	6.82-3.07	6.93-2.54	2.73-4.52	5.81-4.14	-1.15-1.53	-1.43-1.59	0.01-4.42	0.53-4.8	8.03-8.83	2.89-3.44	4.29-4.52	-1.10-1.72	5.61-6.16	
(H12.5)	8.36-6.68	4.93-3.01	-1.72-4.81	-5.14-5.64	-7.88-10.15	-17.99-11.42	9.98-14.22	-12.44-8.77	6.74-6.53	3.95-4.49	-5.52-7.38	-0.89-6.67	4.63-4.77	3.71-5.64	8.54-11.44	6.61-6.42	-1.72-8.89	-8.97-4.3	-10.47-8.99	-7.99-11.44	6.19-5.21	5.21-5.75	-8.86-7.96	14.02-8.92	
(H12.5)	8.93-6.52	5.07-3.34	5.97-5.52	6.47-8.88	9.18-9.11	-17.97-12.36	-12.32-10.9	-17.97-12.36	-7.16-6.53	0.86-0.85	8.67-8.73	-10.57-9.75	7.8-7.36	6.89-7.94	3.93-1.79	9.22-7.61	-10.51-11.1	-10.47-10.9	-7.99-7.87	2.97-3.65	3.95-3.62	4.46-4.78	4.46-4.78	4.46-4.78	
(H12.5)	8.03-6.36	5.66-6.41	-1.76-6.69	6.22-11.28	-11.52-11.77	-18.95-17.69	-15.48-17.68	-14.42-16.76	-8.9-6.87	6.66-7.2	7.14-8.53	-11.36-11.49	-12.35-9.46	-7.53-11.1	-12.23-8.67	-11.29-8.66	6.96-11.8	-11.04-9.41	-11.75-8.64	-10.45-7.26	-10.35-10.28	4.23-4.51	6.46-10.46	6.55-6.89	
(H12.5)	8.75-6.91	6.78-6.89	-1.76-2.13	8.65-11.13	-10.89-12.83	-18.67-17.97	-15.48-17.63	-18.94-18.4	6.14-6.83	8.9-8.12	7.99-6.71	-10.17-18.49	-10.17-18.49	-6.78-13.56	-8.09-7.34	8.73-5.86	-8.87-17.14	-11.81-10.65	-13.48-10.76	-17.01-16.16	6.63-10.43	-1.49-10.46	-12.14-9.89	-12.14-9.89	
(H12.5)	-4.02-5.68	-7.06-7.41	-8.09-8.16	-11.37-10.58	-13.04-13.01	-18.94-17.44	-16.29-17																		



# Radiated Composite Gain Data of 5GHz

# Appendix B

φ (112.5°)	-10.88-10.92	-17.48-11.46	-11.18-18.26	-12.82-12.46	-14.79-14.38	-17.94-18.99	-18.58-17.31	-18.6-19.83	-15.01-9.25	-14.29-12.05	-12.83-12.24	-18.71-19.08	-17.66-14.51	-14.65-17.85	-14.02-11.61	-13.21-18.72	-17.99-19.04	-18.72-13.11	-13.73-13.16	-9.65-13.96	-17.34-12.39	-13.11-14.4	-12.51-14.4	-12.72-12.78									
φ (120°)	-11.42-17.78	-18.36-10.14	-12.85-12.62	-8.24-927	-13.81-15.83	-11.44-13.62	-17.65-19.06	-18.03-17.37	-14.14-12.23	-14.17.38	-12.02-14.79	-17.72-15.13	-17.58-11.32	-18.33-17.11	-14.68-17.42	-13.71-18.67	-19.2-18.91	-17.43-19.21	-10.34-11.26	-15.25-11.15	-14.24-11.58	-11.58-18.36	-11.48-11.28	-16.38-18.84	-17.51-18.2	-17.75-16.05							
φ (125°)	-17.82-18.52	-13.55-11.34	-17.39-14.18	-9.68-10.74	-10.35-12.38	-12.03-11.27	-15.82-19.11	-14.61-17.84	-18.81-14.7	-17.03-16.07	-16.27-16.58	-16.57-15.19	-18.86-17.28	-19.25-13.66	-11.26-16.97	-14.13-18.32	-14.85-14.13	-11.63-9.66	-9.56-14.47	-16.67-10.54	-11.46-11.93	-16.05-14.62	-15.75-13.49										
φ (130°)	-18.73-16.86	-12.07-11.77	-17.73-12.79	-11.21-9.72	-12.37-11.44	8.07-10.17	-18.92-10.12	-12.91-18.61	-18.21-18.33	-18.41-15.05	-16.41-18.03	-11.94-14.74	-19.06-17.01	-18.34-11.96	-15.31-10.95	-12.83-9.06	-16.26-13.55	-15.91-11.96	-9.48-11.66	8.51-11.89	-12.25-18.86	-11.01-14.07	-10.72-14.12	-11.42-16.33									
φ (142.5°)	-18.62-19.78	-15.81-15.97	-12.85-9.71	-8.56-11.38	6.51-9.77	-11.11-11.21	-18.11-11.86	-8.26-10.81	-10.29-13.11	-11.64-14.28	-16.86-16.28	-18.88-15.15	-17.81-14.91	-18.19-18.79	-13.81-12.14	-10.62-11.51	-17.16-15.88	-15.91-13.72	-8.65-10.27	-12.61-12.81	-11.48-11.28	-16.38-18.84	-17.51-18.2	-17.75-16.05									
φ (150°)	-17.48-16.72	-17.18-17.17	-13.99-10.32	9.75-11.38	-13.04-10.35	9.5-11.38	-11.49-11.93	-11.84-13.91	-13.62-13.75	-14.36-13.71	-17.51-15.37	-12.56-15.86	-16.65-17.4	-17.15-15.71	-14.17-12.71	-18.41-18.03	-13.81-12.41	-14.41-8.82	9.63-10.02	-13.86-14.83	-18.88-13.15	-11.34-13.13	-14.21-15.93	-14.71-17.93									
φ (162.5°)	-19.03-18.88	-19.26-17.22	-12.82-18.21	-18.48-17.91	-15.71-11.02	9.49-9.98	-11.49-11.93	-11.84-13.91	-17.46-18.65	-17.71-18.34	-16.64-14.68	-14.61-18.13	-19.55-17.2	-16.71-14.72	-15.58-19	-19.06-17.31	-12.46-16.35	-16.88-18.78	-14.11-9.18	-17.31-12.67	-14.96-18.66	-17.75-17.73	-14.71-17.93	-17.75-16.05									
φ (175°)	-17.48-17.42	-17.48-15.52	-11.53-19.33	-18.15-16.05	-11.73-10.66	-10.31-11.12	-12.88-17.21	-19.08-18.92	-18.21-18.39	-18.01-17.67	-18.17-18.64	-18.48-19.19	-19.37-15.75	-18.66-17.52	-19.02-12.78	8.99-8.53	8.53-10.11	-12.64-18.08	-17.98-14.54	-12.61-12.53	-12.82-13.81	-17.25-19.05	-18.08-18.16	-17.75-16.05									
φ (180°)	-18.48-18.44	-17.48-18.48	-18.48-17.48	-10.42-16.15	-11.43-12.83	-14.18-15.54	-15.73-17.63	-18.58-18.28	-16.53-14.8	-13.96-14.08	-15.14-17.57	-17.86-17.44	-17.86-17.44	-18.36-18.64	-14.05-12.24	-12.72-12.72	8.62-8.58	8.78-10.16	-10.28-16.78	-10.52-10.49	-10.43-11.13	-11.19-12.74	-15.02-18.81	-18.58-17.48									
FreeRad 1	5.95994	FreeRad 2																															
Gain	φ(112.5°)	φ(115°)	φ(120°)	φ(125°)	φ(130°)	φ(142.5°)	φ(150°)	φ(162.5°)	φ(175°)	φ(180°)	φ(187.5°)	φ(195°)	φ(202.5°)	φ(210°)	φ(217.5°)	φ(225°)	φ(232.5°)	φ(240°)	φ(247.5°)	φ(255°)	φ(262.5°)	φ(270°)	φ(277.5°)	φ(285°)	φ(292.5°)	φ(300°)	φ(307.5°)	φ(315°)	φ(322.5°)	φ(330°)	φ(337.5°)	φ(345°)	φ(352.5°)
φ (112.5°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (115°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (120°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (125°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (130°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (142.5°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (150°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (162.5°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (175°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (180°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (187.5°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (195°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (202.5°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (210°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (217.5°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (225°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32	-11.35-13.72	-17.74-19.08	-18.19-17.48	-15.04-11.96	-11.64-9.9	8.41-7.27	-6.43-7.5	-6.73-6.5	-7.11-6.2	-7.14-6.2	-8.44-7.1	-9.26-8.1	-9.34-7.4	-10.11-6.2	-10.72-6.2	-11.42-6.2	-12.12-6.2	-12.82-6.2	-13.52-6.2
φ (232.5°)	3.268-9.88	12.23-16.43	-18.22-18.34	-18.19-16.35	13.62-13.22	-11.17-9.68	-8.42-9.57	-7.23-7.38	-7.61-7.55	-7.49-7.43	-7.55-7.41	-7.47-7.59	-7.88-7.41	8.63-10.32																			



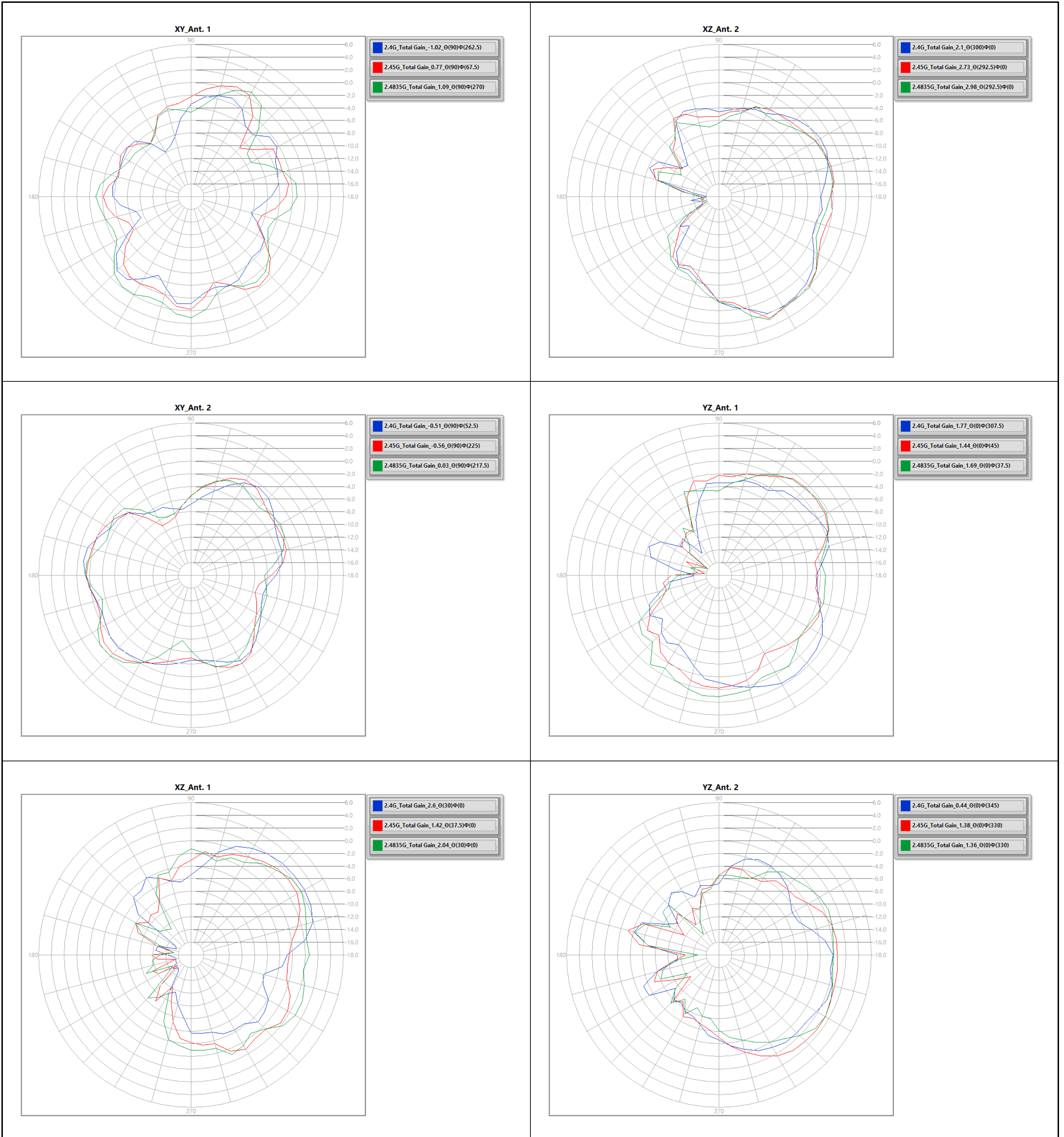


# Antenna Pattern of 2.4GHz

# Appendix C

Theta (°)	0.02026	0.08092	1.21140	1.46143	1.28104	0.63017	-0.35084	-1.24152	-1.68170	-1.67161	-1.50131	-1.07080	-0.61048	-0.40034	-0.20009	0.52099	1.42165	1.61138	1.00057	0.06042	-0.79104	-1.17118	-1.03100	-0.53023	
Phi (°)	0.38010	0.48059	1.40170	1.83180	1.52096	0.25080	-1.80040	-3.10024	-3.01022	-2.21172	-1.22075	-0.28001	0.11009	-0.69029	-0.38013	0.44122	1.86035	2.32194	1.88072	0.01067	-1.27174	-2.00023	-1.89165	-1.24081	
Phi (°)	-1.10058	-0.01059	1.14159	1.91022	1.79114	0.02143	-2.89039	-4.17030	-3.37027	-2.07132	-0.48031	0.82029	1.33116	0.74022	-0.20025	0.24110	1.91035	2.38198	1.96065	-0.06069	-1.14141	-1.56170	-1.82194	-1.83050	
Phi (°)	-1.62108	-0.69028	0.52118	1.76214	2.09144	0.17157	-3.11031	-3.20022	-2.19189	-1.54100	-0.22061	1.31180	2.01133	1.59110	0.58031	0.52106	1.68029	2.15177	1.90151	-0.11055	-0.79088	-0.99134	-1.84028	-2.45015	
Phi (°)	-1.85026	-1.06077	-0.18069	1.63234	2.43168	0.10196	-3.26036	-2.13136	-0.87060	-0.41003	0.56132	1.78157	2.20183	1.47103	0.69064	0.91137	1.84211	2.07162	1.61043	-0.02028	-0.59066	-0.89158	-2.30087	-3.02054	
Phi (°)	-2.12017	-1.47048	-0.18037	0.81081	1.92095	-1.00049	-4.61039	-2.81023	-1.42089	-0.58023	0.58164	2.20239	2.30202	1.54100	0.50029	0.48094	1.43164	1.68092	0.38006	0.01000	-0.08040	-0.89151	-2.13026	-2.84056	
Phi (°)	-2.70197	-1.59055	-1.45031	0.05067	1.05003	-1.80031	-4.82043	-3.44030	-2.66053	-1.39011	0.01128	2.14263	2.73020	2.09103	1.30091	0.49025	0.29031	0.07038	-0.77088	-0.77088	-0.54011	0.00033	-0.97189	-2.34028	-3.82070
Phi (°)	-4.03023	-2.23020	-2.00135	-0.38050	0.57046	-2.14032	-4.04038	-3.89031	-3.96036	-2.45022	-1.29033	0.15039	0.54056	0.53079	1.18122	0.70003	0.50075	-1.13074	-2.14020	-1.54006	0.91130	-2.19036	-3.80047	-4.83089	
Phi (°)	-5.53010	-2.54025	-2.29088	-0.78002	0.00109	-2.61036	-4.13049	-4.22049	-4.69042	-3.10022	-1.61080	-0.68089	-1.14060	-1.88027	-2.22030	0.32016	-0.82047	-2.22030	-3.46027	-2.68021	-2.23020	-4.11019	-5.59075	-6.01074	
Phi (°)	-6.57037	-2.45042	-2.49043	-1.05089	-0.03143	-2.76040	-5.03091	-4.47085	-6.99054	-4.01010	-2.48017	-1.86086	-1.53085	-2.90047	-1.49083	-0.59013	-2.16033	-3.89046	-4.97024	-3.16022	-1.99025	-4.04040	-6.10085	-7.94072	
Phi (°)	-7.27010	-2.22046	-2.97039	-1.14020	-0.69056	-2.76040	-5.03091	-4.47085	-6.99054	-4.01010	-2.48017	-1.86086	-1.53085	-2.90047	-1.49083	-0.59013	-2.16033	-3.89046	-4.97024	-3.16022	-1.99025	-4.04040	-6.10085	-7.94072	
Phi (°)	-8.07050	-1.91051	-3.48072	-1.14020	-1.48079	-3.06047	-7.33048	-6.06011	-8.06011	-4.60017	-2.83075	-2.52052	-3.03091	-5.16080	-3.98017	-4.14024	-1.48018	-2.78035	-4.98077	-4.88034	-3.50029	-5.22044	-7.24014	-9.38085	
Phi (°)	-9.56036	-1.12037	-4.19048	-1.18056	-2.71046	-10.23049	-5.29039	-6.99047	-9.78010	-5.78010	-3.81099	-5.32063	-6.16070	-8.24046	-6.03017	-2.69079	-3.32032	-4.68034	-7.19078	-7.90060	-6.59040	-7.08071	-9.26071	-11.79058	
Phi (°)	-1.79032	-3.34032	-4.47049	-4.98070	-2.57026	-4.22073	-9.52076	-4.51036	-3.69042	-5.59044	-2.89035	-5.40054	-5.52077	-6.69075	-7.44047	-5.96002	-6.45031	-6.02024	-4.74072	-6.66071	-7.14075	-6.05005	-6.16059	-5.16035	
Phi (°)	-4.80035	-5.83045	-7.32024	-7.98072	-4.10042	-6.28018	-11.98076	-4.32046	-6.46036	-7.74043	-3.98063	-7.51071	-6.99056	-8.69079	-8.18041	-6.30013	-7.20033	-6.20025	-4.99057	-6.92047	-7.33010	-6.68040	-7.72081	-6.28074	
Phi (°)	-7.74071	-6.53040	-7.65080	-6.98054	-4.41041	-6.08072	-8.71088	-6.41052	-8.38020	-10.13077	-6.39048	-11.03013	-8.79046	-9.31068	-8.93072	-7.76020	-6.08027	-5.33039	-7.71047	-7.17047	-7.21073	-7.35042	-8.30071	-6.28085	
Phi (°)	-10.77095	-7.88030	-8.75032	-8.38082	-4.09047	-8.94078	-9.97025	-8.84008	-12.77056	-12.22077	-9.79018	-14.66013	-10.34030	-11.10020	-12.20084	-10.90018	-11.66005	-11.67032	-12.34058	-8.42073	-8.86047	-9.17030	-11.77046	-10.41010	
Phi (°)	-14.74082	-5.29044	-8.57034	-4.81012	-8.28012	-12.21023	-11.89043	-10.08066	-11.15019	-11.69050	-12.56048	-13.88022	-11.88020	-10.47040	-9.93081	-7.78056	-8.14028	-10.30042	-9.50052	-7.84070	-8.68040	-10.10012	-13.01025	-11.01015	
Phi (°)	-18.80042	-6.03047	-7.13040	-10.29032	-12.62053	-8.15034	-5.14037	-4.00034	-4.22074	-6.00075	-8.49040	-13.31049	-15.71038	-15.41037	-12.02045	-8.86072	-6.42047	-6.20061	-6.96078	-7.47017	-8.76070	-7.15006	-8.79083	-8.20070	
Phi (°)	-7.73076	-8.27061	-10.05069	-11.10032	-9.22053	-6.67024	-3.13040	-1.99088	-2.10026	-3.65045	-6.73069	-11.22014	-14.99016	-15.04033	-13.87020	-11.20028	-9.91077	-9.82009	-10.21052	-12.12036	-11.93017	-12.19012	-12.42035	-12.61045	
Phi (°)	-12.68012	-13.47046	-14.49040	-12.65013	-9.59037	-7.34021	-5.34074	-4.43044	-4.77045	-6.26042	-8.40087	-12.52048	-15.98016	-15.88013	-14.46011	-11.20028	-9.91077	-9.82009	-10.21052	-12.12036	-11.93017	-12.19012	-12.42035	-12.61045	
Phi (°)	-15.00057	-14.77043	-15.49049	-14.79045	-12.97025	-12.38023	-12.77021	-12.97021	-13.95043	-15.15025	-15.46013	-15.33014	-15.88013	-15.44011	-13.63014	-12.93039	-14.14049	-15.21058	-15.24033	-15.66010	-15.64047	-15.68010	-15.24033	-15.82015	
Phi (°)	-2.48350	2.48350	1.21140	1.46143	1.28104	0.63017	-0.35084	-1.24152	-1.68170	-1.67161	-1.50131	-1.07080	-0.61048	-0.40034	-0.20009	0.52099	1.42165	1.61138	1.00057	0.06042	-0.79104	-1.17118	-1.03100	-0.53023	
Gain	0(°)/0(7.5°)	0(15°)/0(22.5°)	0(30°)/0(37.5°)	0(45°)/0(52.5°)	0(60°)/0(67.5°)	0(75°)/0(82.5°)	0(90°)/0(97.5°)	0(105°)/0(112.5°)	0(120°)/0(127.5°)	0(135°)/0(142.5°)	0(150°)/0(157.5°)	0(165°)/0(172.5°)	0(180°)/0(187.5°)	0(195°)/0(202.5°)	0(210°)/0(217.5°)	0(225°)/0(232.5°)	0(240°)/0(247.5°)	0(255°)/0(262.5°)	0(270°)/0(277.5°)	0(285°)/0(292.5°)	0(300°)/0(307.5°)	0(315°)/0(322.5°)	0(330°)/0(337.5°)	0(345°)/0(352.5°)	
Phi (°)	-0.47003	-0.67057	-0.45033	-0.19005	0.02006	0.08004	0.02009	0.19022	0.25024	0.13004	-0.19033	-0.49067	-0.80091	-0.90056	-0.95082	-0.60038	-0.21009	0.03008	0.01012	-0.19022	-0.27033	-0.42045	-0.36022	-0.18026	
Phi (°)	0.11004	0.02004	0.06012	0.16021	0.34022	0.20012	0.15017	0.02005	0.03000	-0.09020	-0.31045	-0.61073	-0.90012	-1.19015	-1.06084	-0.53023	-0.04000	0.04000	0.06003	0.05000	-0.04000	-0.15024	-0.32038	-0.31013	-0.01005
Phi (°)	0.16520	0.29042	0.55062	0.70078	0.82082	0.73059	0.45013	0.11011	-0.33046	-0.59068	-0.80094	-1.12030	-1.45015	-1.54013	-0.97040	0.17089	1.06013	1.00081	0.50029	0.03026	-0.52075	-0.94014	-1.00078	-0.45012	
Phi (°)	0.15021	0.48076	0.99116	1.29040	1.44136	1.14086	0.62033	0.01028	-0.58077	-0.93013	-1.10015	-1.23012	-1.40046	-1.44023	-0.73008	0.10080	2.23030	2.00010	1.03007	-0.14073	-1.30018	-2.15029	-2.16018	-1.24082	
Phi (°)	0.52001	0.51091	1.21044	1.65180	1.89168	1.60081	0.90022	-0.64091	-1.08016	-1.17017	-1.01015	-0.78045	-0.22013	-0.16046	-0.74095	-0.58039	1.57021	3.03010	2.77013	1.96040	-0.08073	-0.88068	-2.29049	-2.46025	
Phi (°)	-1.32063	0.07064	1.03034	1.65194	2.06090	1.42055	-0.42043	-2.05021	-2.26079	-1.39078	0.03076	1.23039	1.96085	0.21031	-0.24061	1.81073	3.20016	2.70090	1.67025	-0.03073	-0.88063	-0.99012	-1.39012	-1.91077	
Phi (°)	-2.33041	-0.50012	0.55039	1.15184	2.14022	1.37023	-1.21046	-3.02026	-2.62021	-1.99035	-0.27086	1.88012	2.71030	1.37079	0.52039	1.75042	2.86041	1.82088	-0.08066	-1.22010	0.66024	0.09026	-0.80018	-2.38025	
Phi (°)	-3.12091	-0.89015	0.31067	1.20086	2.31018	1.34029	-1.56045	-2.48020	-1.56041	-1.48017	-0.19809	1.70214	2.20194	1.60108	0.87048	2.06022	2.32078	1.60027	-1.11035	-1.01044	0.23045	-1.08014	-2.34035	-3.01005	
Phi (°)	-4.54043	-2.26034	-1.12043	-0.59047	-0.26026	-0.96050	-1.79060	-2.87030	-3.36020	-1.74016	-1.13015	-0.40010	-0.18001	0.82021	2.19180	1.15072	0.78024	1.88029	2.18045	0.26018	-1.11028	-1.92016	-1.17017	-2.44035	
Phi (°)	-2.57012	-1.22054	-0.28013	-0.01041	0.77037	0.99033	-1.49035	-4.70031	-2.83018	-1.52018	-0.77082	2.20299	2.98020	1.49014	1.31049	1.63018	1.65002	-1.44028	-3.09025	-1.84019	-0.90030	0.98010	-1.88010	-1.87026	
Phi (°)	-4.29014	-2.38015	-1.16015	-1.04068	-0.37082	-2.02039	-5.34056	-5.78056	-4.41033	-2.21025	-2.28013	0.07018	1.48018	0.83093	1.47011	1.37078	0.16056	-3.29044	-4.19036	-2.11040	-1.11035	-1.73090	-1.90015	-2.41049	
Phi (°)	-5.18049	-2.88021	-1.71071	-1.86047	-1.14065	-2.79047	-5.30071	-6.60045	-5.11030	-2.91020	-2.90022	-1.21052	-0.75089	-1.89068	0.68010	1.13038	0.76028	-4.37069	-4.87065	-2.73027	-2.24020	-3.46037	-3.92079	-3.90041	
Phi (°)	-6.41081	-3.88028	-1.79024	-2.83047	-1.70084	-2.84085	-5.51092	-7.90012	-7.47047	-5.07077	-2.27057	-2.71045	-1.37029	-3.57086	-1.04003	0.01070	0.24040	-6.25088	-6.14026	-3.71089	-2.96078	-4.68018	-5.39051	-5.98011	
Phi (°)	-8.91037	-2.51080	-1.85026	-3.07088	-2.61026	-3.64016	-7.02060	-10.16022	-7.19044	-2.65024	-3.44019	-4.99036	-2.99072	-4.61031	-1.61070	0.26016	0.42023	-7.46087	-7.88035	-3.83021	-2.51007	-4.24014	-5.98058	-7.10074	
Phi (°)	-6.43043	-3.26034	-1.12043	-0.59047	-0.26026	-0.96050	-1.79060	-2.87030	-3.36020	-1.74016	-1.13015	-0.40010	-0.18001	0.82021	2.19180	1.15072	0.78024	1.88029	2.18045	0.26018	-1.11028	-1.92016	-1.17017	-2.44035	
Phi (°)	-9.59032	-3																							

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 5GHz

# Appendix D

φ(22.5°)	0.71144	-1.72193	-2.11239	-3.20428	-5.14434	-4.81377	-2.85229	-2.04188	-2.04420	-2.41127	-2.29221	-2.53300	-3.37349	-3.29292	-2.43183	-1.01103	0.16037	0.68079	0.99093	0.29102	-1.32148	-1.35089	-0.43008	0.11020
φ(30°)	0.67186	-2.22127	-1.60499	0.85073	-0.53108	-1.65218	-2.01157	-1.20403	-0.97199	-1.06108	-0.66002	0.01052	0.71624	1.48193	1.39045	0.15027	0.88959	0.31088	-1.21043	-0.63191	-2.83129	0.51150	1.83148	0.71616
φ(37.5°)	-2.92122	-1.32159	-0.86069	-0.86069	-1.73064	1.05194	2.19221	1.59161	1.59161	1.31004	0.38249	3.89414	3.60299	2.20177	1.67116	-0.03107	-0.89042	-0.30406	-0.16010	1.29244	1.19244	1.59244	1.43011	-0.72132
φ(45°)	-1.89103	0.37075	0.67615	0.07111	-0.09136	-1.04177	1.33049	2.82392	3.99344	3.43048	2.62028	2.13016	-0.69110	2.48380	4.84848	3.15242	2.40186	0.35138	-0.83053	0.30400	-0.05065	1.00122	-0.01167	0.23160
φ(52.5°)	-1.46133	-0.74134	1.81091	0.29612	-0.20111	-0.48123	-0.44110	2.26335	3.74428	4.44459	3.42523	2.32077	2.07610	6.06463	1.93143	1.60166	-1.51197	-0.10051	-0.50007	0.01028	-0.15048	0.82133	0.84105	-0.90139
φ(60°)	-1.30102	-3.20109	0.54011	0.16026	0.61247	-1.21074	-0.05285	4.61516	5.82534	4.11254	2.22199	2.13116	1.99944	6.16176	2.20148	1.48013	-1.27195	-0.70020	0.04127	-0.26045	0.33113	0.84105	0.90139	-0.30139
φ(67.5°)	-0.37167	-5.71179	0.01676	-1.34114	-1.70139	-0.86670	-2.86129	-0.02728	-0.02728	-0.02728	-0.02728	-0.02728	-0.02728	-0.02728	-0.02728	-0.02728	-0.02728	-0.02728	-0.02728	-0.02728	-0.02728	-0.02728	-0.02728	-0.02728
φ(75°)	-0.71149	-4.91207	0.90190	2.88122	2.15497	-12.82192	-4.77145	4.93469	5.30646	3.04456	0.81161	2.62027	1.39217	3.09314	1.90199	2.25183	0.35109	-0.82118	0.38636	-0.27123	1.39170	0.88159	1.37104	-0.10120
φ(82.5°)	-1.01135	-3.86123	2.30148	-4.82132	2.98164	-10.22168	-4.77126	-3.83191	3.94302	4.11027	0.86131	-1.05064	0.51032	-4.48119	0.61197	1.58163	2.59172	-4.44123	-1.54267	0.53629	-0.00060	0.15049	-0.84131	-4.30155
φ(90°)	-0.29187	-3.80128	2.30148	-5.62141	4.64167	-10.22168	-4.77126	-3.83191	3.94302	4.11027	0.86131	-1.05064	0.51032	-4.48119	0.61197	1.58163	2.59172	-4.44123	-1.54267	0.53629	-0.00060	0.15049	-0.84131	-4.30155
φ(97.5°)	0.50142	-4.02128	3.14148	-5.29137	5.11018	-10.50197	-5.39195	-5.29137	5.11018	-10.50197	-5.39195	-5.29137	5.11018	-10.50197	-5.39195	-5.29137	5.11018	-10.50197	-5.39195	-5.29137	5.11018	-10.50197	-5.39195	-5.29137
φ(105°)	0.55039	-4.76125	4.30140	-4.95146	6.39103	-10.80168	-5.99137	-1.21149	-5.34329	-2.24126	-4.62168	7.71125	4.49147	-2.89132	7.03109	5.99137	6.70125	-4.90120	-1.70125	0.50120	-0.71125	3.90120	3.90120	4.44125
φ(112.5°)	0.75156	-5.03143	5.52144	-4.85150	7.78112	-10.58120	-2.24159	-0.86102	2.24159	-0.86102	2.24159	-0.86102	2.24159	-0.86102	2.24159	-0.86102	2.24159	-0.86102	2.24159	-0.86102	2.24159	-0.86102	2.24159	-0.86102
φ(120°)	0.87161	-5.28143	6.30147	-5.34174	9.03175	-10.71142	-1.23151	-0.21152	1.23151	-0.21152	1.23151	-0.21152	1.23151	-0.21152	1.23151	-0.21152	1.23151	-0.21152	1.23151	-0.21152	1.23151	-0.21152	1.23151	-0.21152
φ(127.5°)	0.97163	-5.53143	7.25145	-5.12158	10.25169	-10.68118	-0.22181	-0.54189	0.54189	-0.54189	0.54189	-0.54189	0.54189	-0.54189	0.54189	-0.54189	0.54189	-0.54189	0.54189	-0.54189	0.54189	-0.54189	0.54189	-0.54189
φ(135°)	0.98169	-5.81147	7.32146	-4.93166	10.49163	-10.58114	0.72156	-0.20144	-0.38144	-0.38144	0.72156	-0.20144	-0.38144	0.72156	-0.20144	-0.38144	0.72156	-0.20144	-0.38144	0.72156	-0.20144	-0.38144	0.72156	-0.20144
φ(142.5°)	0.89175	-6.11147	7.32146	-4.63166	10.49163	-10.58114	0.72156	-0.20144	-0.38144	-0.38144	0.72156	-0.20144	-0.38144	0.72156	-0.20144	-0.38144	0.72156	-0.20144	-0.38144	0.72156	-0.20144	-0.38144	0.72156	-0.20144
φ(150°)	-1.21145	-10.40152	-10.28102	-10.21985	-10.13958	-8.83112	-7.19348	-6.01196	-4.71199	-3.78199	-3.06199	-2.51199	-2.10199	-1.76199	-1.47199	-1.21199	-1.00199	-0.82199	-0.67199	-0.54199	-0.43199	-0.34199	-0.26199	-0.19199
φ(157.5°)	-1.11104	-10.19103	-8.74103	-12.42143	-10.86138	-7.83144	-6.75145	-11.28148	-14.86152	-15.98137	-11.67112	-12.56112	-10.68115	-15.91106	-15.14109	-14.61108	-11.88136	-6.45112	-11.42133	-10.25169	-8.60118	-14.90145	-15.41102	-12.73163
φ(165°)	-0.93105	-9.99107	-8.14103	-14.86118	-11.59160	-8.15160	-8.15160	-11.27141	-15.11156	-16.70148	-11.70113	-11.70113	-10.83109	-16.81152	-13.24136	-13.03133	-11.01108	-6.45112	-11.28133	-10.25169	-8.60118	-14.90145	-15.41102	-12.73163
φ(172.5°)	-1.03114	-9.21126	-6.13104	-11.20134	-11.06118	-9.54157	-9.41175	-10.42131	-14.71156	-16.44137	-12.31140	-11.45111	-11.18115	-11.91121	-11.22103	-10.80178	-10.78112	-10.23140	-11.12137	-10.51126	-10.19122	-9.24187	-8.99147	-8.06151
φ(180°)	-0.72168	-8.15129	6.60111	-8.66118	-10.30113	-13.03136	-14.24135	-14.53135	-15.75142	-14.60151	-15.71169	-15.14162	-13.91137	-15.81142	-13.34113	-12.71120	-11.70112	-11.12133	-10.21133	-10.09126	-9.79167	-10.18103	-10.07198	-9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162	13.91137	15.81142	13.34113	12.71120	11.70112	11.12133	10.21133	10.09126	9.79167	10.18103	10.07198	9.26151
φ(180°)	0.72168	8.15129	-6.60111	8.66118	10.30113	13.03136	14.24135	14.53135	15.75142	14.60151	15.71169	15.14162</												

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  $\Theta(0-180)\Phi(270)$

