



# Antenna Composite Gain Test Report

Equipment	Wi-Fi 7 Router
Brand Name	brightspeed
Model Name	XR1710G
Applicant	Gemtek Technology Co., Ltd. No. 15-1 Zhonghua Road, Hsinchu Industrial Park, Hukou, Hsinchu, Taiwan, 30352.
Manufacturer	Gemtek Technology Co., Ltd. No. 15-1 Zhonghua Road, Hsinchu Industrial Park, Hukou, Hsinchu, Taiwan, 30352.
Standard	KDB 662911 D03 v01
Sample Received	Jan. 15, 2024
Start Test Date	Jan. 19, 2024
Final Test Date	Jan. 26, 2024



Approved by: Jackson Tsai

**SPORTON INTERNATIONAL INC. Hsinhua Laboratory**

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



## Table of Contents

History of this test report.....	3
1. Operation Mode and Antenna Information .....	4
2. Test Frequency .....	4
3. Testing Location.....	5
4. Test Facility and Configuration.....	6
5. Reference Calibration .....	7
6. Test Method .....	8
7. Measured Values and Calculation of Maximum Gain Positions.....	9
8. Summary of Test Result .....	11
9. Test Setup .....	13
10. Test Equipment and Calibration Data .....	14
11. Test Results .....	15



**History of this test report**

Report No.	Version	Description	Issued Date
AP411518	01	Initial issue of report	Apr. 02, 2024



### 1. Operation Mode and Antenna Information

Antenna Position	RF Port	Brand Name	Model Name	Ant. Type	Connector	Modes of Operation
2G5G Ant1	1	Gemtek	XR1710G_Dual_Ant1	PIFA	UFL	2.4GHz, 5GHz
2G5G Ant2	2	Gemtek	XR1710G_Dual_Ant2	PIFA	UFL	2.4GHz, 5GHz
2G5G Ant3	3	Gemtek	XR1710G_Dual_Ant3	PIFA	UFL	2.4GHz, 5GHz
2G5G Ant4	4	Gemtek	XR1710G_Dual_Ant4	PIFA	UFL	2.4GHz, 5GHz
6G Ant1	1	Gemtek	XR1710G_6E_Ant1	PIFA	UFL	6GHz
6G Ant2	2	Gemtek	XR1710G_6E_Ant2	PIFA	UFL	6GHz
6G Ant3	3	Gemtek	XR1710G_6E_Ant3	PIFA	UFL	6GHz
6G Ant4	4	Gemtek	XR1710G_6E_Ant4	PIFA	UFL	6GHz

Note:

#### 2.4GHz, 5GHz Operation Mode (4TX/4RX)

2G5G Ant1~2G5G Ant4 could transmit/receive simultaneously.

#### 6GHz Operation Mode (4TX/4RX)

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

### 2. Test Frequency

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

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



### 3. Testing Location

<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
Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
Radiated	05CH03-HY	Vasari Huang	23.5~24.5°C / 45~55%	19/Jan/2024~26/Jan/2024

Note:

Testing Site Information

Brand Name: TDK

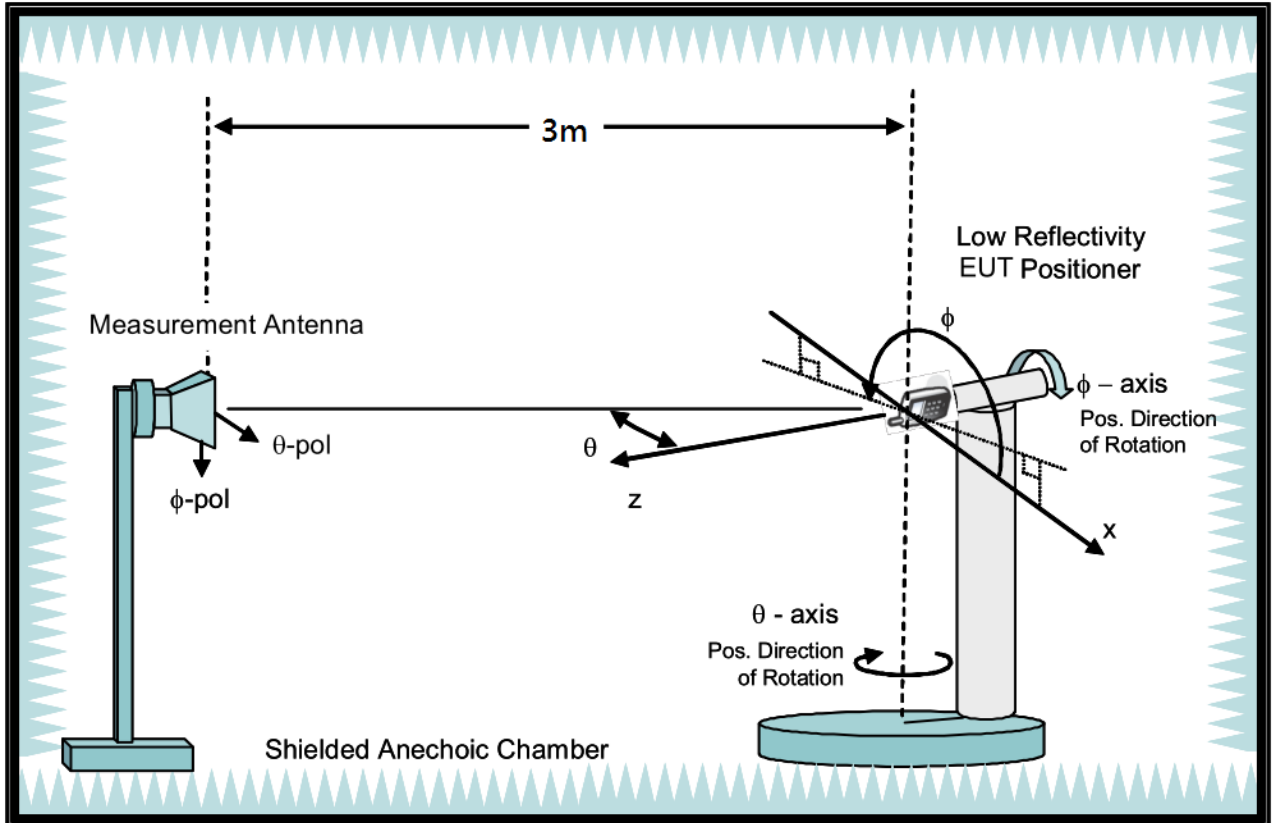
Dimension: 11m\*6m\*6m

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).

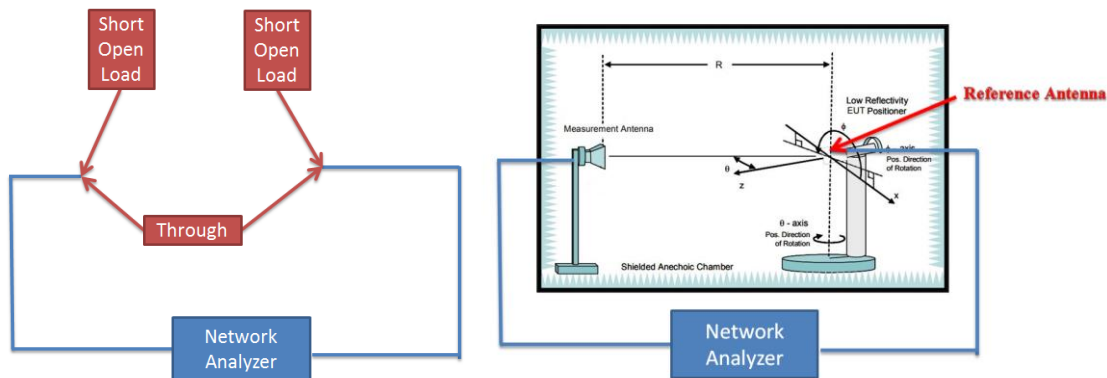
#Reference to CTIA “ctia-test-plan-for-wireless-device-over-the-air-performance-ver-3-7-1”



### 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

2G5G Ant.

Frequency (Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 (dBi)	-2.69	1.23	1.39	-0.61	-0.98
Ant. 2 (dBi)	-3.24	-0.06	-3.35	-1.28	-0.56
Ant. 3 (dBi)	1.18	1.38	1.34	1.66	1.66
Ant. 4 (dBi))	-8.63	2.39	2.75	3.06	2.96
DG [1SS] (dBi)	3.34	7.3	6.83	6.9	6.94
Polarization	Theta	Phi	Phi	Phi	Theta
$\Theta(^{\circ})$	67.5	0	7.5	7.5	7.5
$\Phi(^{\circ})$	300	315	315	135	217.5

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

6G Ant.

Frequency (Hz)	6.175G	6.475G	6.695G	6.995G
Ant. 1 (dBi)	0.29	1.81	1.86	1.85
Ant. 2 (dBi)	2.21	1.24	1.7	1.47
Ant. 3 (dBi)	-3.61	-6.65	-11.59	-9.5
Ant. 4 (dBi))	3.38	-1.5	-0.03	-1.93
DG [1SS] (dBi)	6.96	5.32	5.38	5
Polarization	Theta	Theta	Theta	Theta
$\Theta(^{\circ})$	82.5	82.5	82.5	82.5
$\Phi(^{\circ})$	270	262.5	255	270

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



DG\_1SS max value position calculation

2G5G Ant.

Frequency (Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 [10^(G/20)]	10^(-2.69/20)	10^(1.23/20)	10^(1.39/20)	10^(-0.61/20)	10^(-0.98/20)
Ant. 2 [10^(G/20)]	10^(-3.24/20)	10^(-0.06/20)	10^(-3.35/20)	10^(-1.28/20)	10^(-0.56/20)
Ant. 3 [10^(G/20)]	10^(1.18/20)	10^(1.38/20)	10^(1.34/20)	10^(1.66/20)	10^(1.66/20)
Ant. 4 [10^(G/20)]	10^(-8.63/20)	10^(2.39/20)	10^(2.75/20)	10^(3.06/20)	10^(2.96/20)
Ant. 1 [10^(G/20)] value	0.734	1.152	1.174	0.932	0.893
Ant. 2 [10^(G/20)] value	0.689	0.993	0.68	0.863	0.938
Ant. 3 [10^(G/20)] value	1.146	1.172	1.167	1.211	1.211
Ant. 4 [10^(G/20)] value	0.37	1.317	1.372	1.422	1.406
Sum All Antenna [Amax]	2.938	4.634	4.393	4.428	4.448
DG [10*log(Amax^2/Nant)]	3.34	7.3	6.83	6.9	6.94

Note:

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

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

6G Ant.

Frequency (Hz)	6.175G	6.475G	6.695G	6.995G
Ant. 1 [10^(G/20)]	10^(0.29/20)	10^(1.81/20)	10^(1.86/20)	10^(1.85/20)
Ant. 2 [10^(G/20)]	10^(2.21/20)	10^(1.24/20)	10^(1.7/20)	10^(1.47/20)
Ant. 3 [10^(G/20)]	10^(-3.61/20)	10^(-6.65/20)	10^(-11.59/20)	10^(-9.5/20)
Ant. 4 [10^(G/20)]	10^(3.38/20)	10^(-1.5/20)	10^(-0.03/20)	10^(-1.93/20)
Ant. 1 [10^(G/20)] value	1.034	1.232	1.239	1.237
Ant. 2 [10^(G/20)] value	1.29	1.153	1.216	1.184
Ant. 3 [10^(G/20)] value	0.66	0.465	0.263	0.335
Ant. 4 [10^(G/20)] value	1.476	0.841	0.997	0.801
Sum All Antenna [Amax]	4.459	3.692	3.715	3.557
DG [10*log(Amax^2/Nant)]	6.96	5.32	5.38	5

Note:

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

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



### 8. Summary of Test Result

2G5G Ant.

Freq(Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	1.02	3.3	3.73	3.44	2.89
Ant. 2 Max Gain (dBi)	1.03	3.75	3.29	2.96	2.09
Ant. 3 Max Gain (dBi)	1.18	4.57	4.14	4.42	3.78
Ant. 4 Max Gain (dBi)	2.01	4.87	4.64	5.25	4.99
Ant. 1 Polarization/ $\Theta$ (°)/ $\Phi$ (°)	Phi/82.5/345	Phi/37.5/330	Phi/37.5/322.5	Theta/30/255	Theta/75/232.5
Ant. 2 Polarization/ $\Theta$ (°)/ $\Phi$ (°)	Phi/22.5/82.5	Phi/22.5/67.5	Phi/22.5/75	Phi/7.5/82.5	Phi/30/262.5
Ant. 3 Polarization/ $\Theta$ (°)/ $\Phi$ (°)	Theta/67.5/300	Theta/30/7.5	Theta/90/262.5	Theta/90/270	Theta/90/270
Ant. 4 Polarization/ $\Theta$ (°)/ $\Phi$ (°)	Theta/60/90	Phi/22.5/345	Phi/22.5/345	Phi/22.5/352.5	Phi/30/352.5
Max Gain (dBi)	2.01	4.87	4.64	5.25	4.99
DG [1SS] (dBi)	3.34	7.3	6.83	6.9	6.94
DG [2SS] (dBi)	2.01	4.87	4.64	5.25	4.99
DG [4SS] (dBi)	2.01	4.87	4.64	5.25	4.99

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)



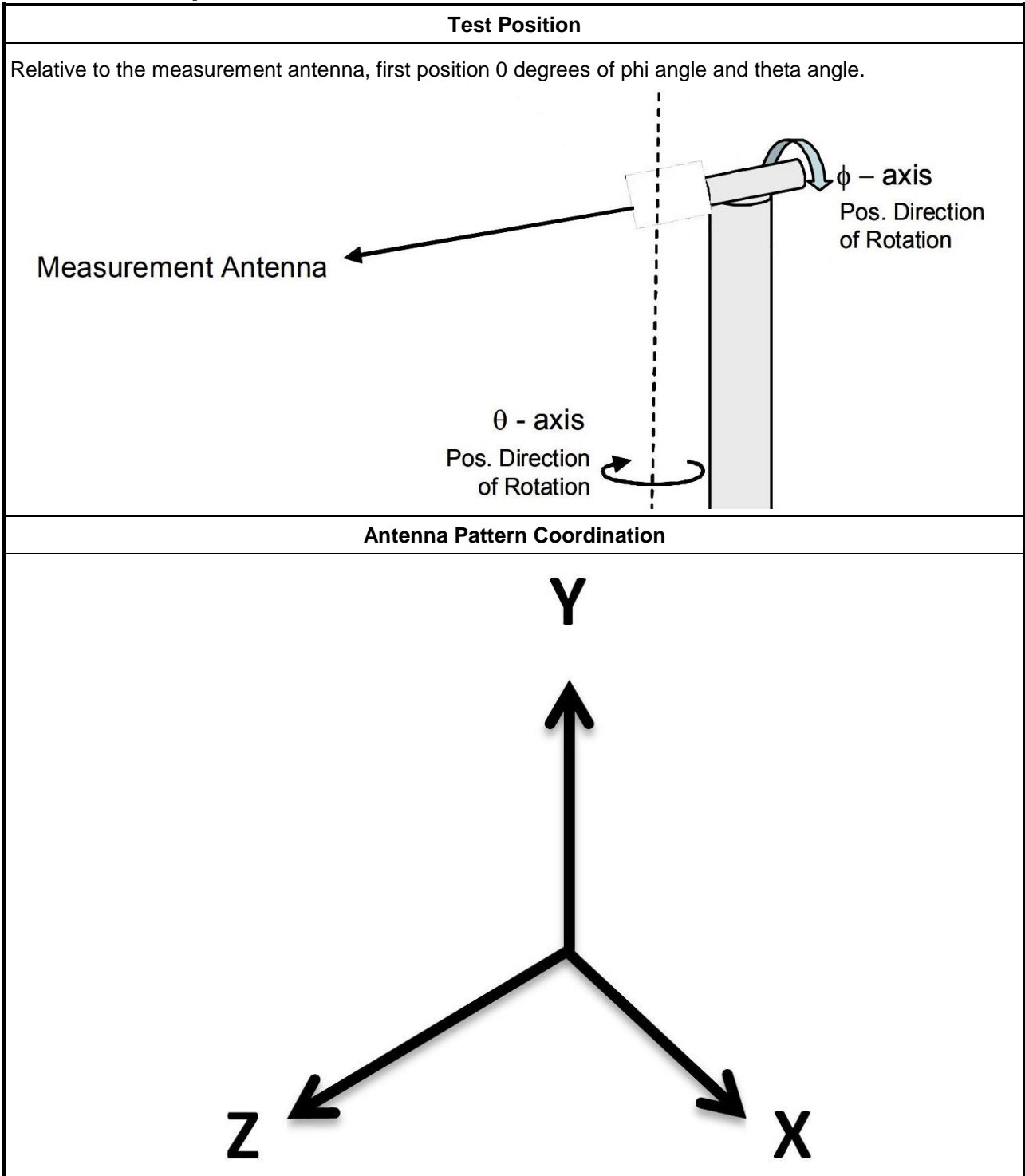
6G Ant.

Freq(Hz)	6.175G	6.475G	6.695G	6.995G
Ant. 1 Max Gain (dBi)	2.07	1.81	1.86	1.85
Ant. 2 Max Gain (dBi)	2.56	1.87	2.15	1.68
Ant. 3 Max Gain (dBi)	2.74	2.28	2.48	1.47
Ant. 4 Max Gain (dBi)	4.4	3.68	1.91	3.99
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/82.5/262.5	Theta/82.5/262.5	Theta/82.5/255	Theta/82.5/270
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/82.5/262.5	Theta/37.5/232.5	Theta/90/262.5	Theta/90/255
Ant. 3 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Phi/30/255	Phi/52.5/255	Phi/52.5/247.5	Phi/52.5/255
Ant. 4 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/60/82.5	Theta/75/82.5	Theta/60/75	Theta/67.5/75
Max Gain (dBi)	4.4	3.68	2.48	3.99
DG [1SS] (dBi)	6.96	5.32	5.38	5
DG [2SS] (dBi)	4.4	3.68	2.48	3.99
DG [4SS] (dBi)	4.4	3.68	2.48	3.99

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)

### 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.

Note: Calibration Interval of instruments listed above is one year.

NCR means Non-Calibration required.



## 11. Test Results

Please refer to the appendix.

Appendix A – Radiated Composite Gain of 2.4GHz&5GHz.....Page 16

Appendix B – Radiated Composite Gain of 6GHz.....Page 31

Appendix C – Antenna Pattern of 2.4GHz&5GHz.....Page 42

Appendix D – Antenna Pattern of 6GHz.....Page 49

Appendix E – Test Photos..... Page 55

————THE END————



Freq(Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	1.02	3.3	3.73	3.44	2.89
Ant. 2 Max Gain (dBi)	1.03	3.75	3.29	2.96	2.09
Ant. 3 Max Gain (dBi)	1.18	4.57	4.14	4.42	3.78
Ant. 4 Max Gain (dBi)	2.01	4.87	4.64	5.25	4.99
Ant. 1 Polarization/ $\theta(^{\circ})/\Phi(^{\circ})$	Phi/82.5/345	Phi/37.5/330	Phi/37.5/322.5	Theta/30/255	Theta/75/232.5
Ant. 2 Polarization/ $\theta(^{\circ})/\Phi(^{\circ})$	Phi/22.5/82.5	Phi/22.5/67.5	Phi/22.5/75	Phi/7.5/82.5	Phi/30/262.5
Ant. 3 Polarization/ $\theta(^{\circ})/\Phi(^{\circ})$	Theta/67.5/300	Theta/30/7.5	Theta/90/262.5	Theta/90/270	Theta/90/270
Ant. 4 Polarization/ $\theta(^{\circ})/\Phi(^{\circ})$	Theta/60/90	Phi/22.5/345	Phi/22.5/345	Phi/22.5/352.5	Phi/30/352.5
Max Gain (dBi)	2.01	4.87	4.64	5.25	4.99
DG [1SS] (dBi)	3.34	7.3	6.83	6.9	6.94
DG [2SS] (dBi)	2.01	4.87	4.64	5.25	4.99
DG [4SS] (dBi)	2.01	4.87	4.64	5.25	4.99





# Radiated Composite Gain Data of 2.4GHz&5GHz

# Appendix A

## DG 1SS Result

Freq(Hz)	2.45GPol	Phi+	Phi-	Phi+	Phi-	Phi+	Phi-	Phi+	Phi-	Phi+	Phi-	Phi+	Phi-	Phi+	Phi-	Phi+	Phi-	Phi+	Phi-	Phi+	Phi-	Phi+	Phi-																										
DG(dB)	Phi(7.5°)	Phi(15°)	Phi(22.5°)	Phi(30°)	Phi(37.5°)	Phi(45°)	Phi(52.5°)	Phi(60°)	Phi(67.5°)	Phi(75°)	Phi(82.5°)	Phi(90°)	Phi(97.5°)	Phi(105°)	Phi(112.5°)	Phi(120°)	Phi(127.5°)	Phi(135°)	Phi(142.5°)	Phi(150°)	Phi(157.5°)	Phi(165°)	Phi(172.5°)	Phi(180°)	Phi(187.5°)	Phi(195°)	Phi(202.5°)	Phi(210°)	Phi(217.5°)	Phi(225°)	Phi(232.5°)	Phi(240°)	Phi(247.5°)	Phi(255°)	Phi(262.5°)	Phi(270°)	Phi(277.5°)	Phi(285°)	Phi(292.5°)	Phi(300°)	Phi(307.5°)	Phi(315°)	Phi(322.5°)	Phi(330°)	Phi(337.5°)	Phi(345°)	Phi(352.5°)		
0(0°)	-0.74-0.62	-0.42-1.02	0.310.68		1.11.25	1.321.23		1.010.67		0.370.1		-0.18-0.45	-0.78-1.14	-1.31-1.19	-0.91-0.66	-0.45-0.32	-0.23-0.05	0.340.76	1.021.15	1.241.34	1.391.33	1.040.78	0.560.34	-0.01-0.48	-0.91-1.12	-1.19-1.19	-1.09-0.95	-0.89-0.9																					
0(7.5°)	-0.61-0.86	-0.98-0.78	-0.370.12		0.661.04	1.181.08		0.730.19		-0.39-0.92	-1.27-1.48	-1.68-1.89	-1.92-1.47	-0.78-0.22	0.150.36	0.490.61	0.911.38	1.762.01	2.182.3	2.421.24	2.321.08	1.761.37	0.840.27	-0.12-0.47	-1.05-0.87	-1.51-0.79	-1.07-0.37	-0.29-0.43																					
0(15°)	0.760.31	-0.17-0.32	-0.130.3		0.821.25	1.461.46		1.190.66		-0.06-0.83	-1.47-1.89	-2.22-2.53	-2.36-1.56	-0.540.26	0.730.92	0.950.97	1.161.58	2.022.31	2.472.56	<b>2.582.61</b>	2.562.45	2.191.79	1.250.61	-0.02-0.61	-0.75-0.49	0.190.68	0.880.8																						



Radiated Composite Gain Data of 2.4GHz&5GHz

Appendix A

Table with columns for frequency (e.g., 2.45GHz, 5.75GHz), polarization (e.g., Phi(7.5), Phi(22.5)), and gain values for various angles (e.g., 0, 7.5, 15, 22.5, 30, 37.5, 45, 52.5, 60, 67.5, 75, 82.5, 90, 97.5, 105, 112.5, 120, 127.5, 135, 142.5, 150, 157.5, 165, 172.5, 180). Includes sub-headers for frequency and polarization.





# Radiated Composite Gain Data of 2.4GHz&5GHz

# Appendix A

## Gain Result

Gain	Phi(7.5°)	Phi(15°)	Phi(30°)	Phi(45°)	Phi(60°)	Phi(75°)	Phi(90°)	Phi(105°)	Phi(120°)	Phi(135°)	Phi(150°)	Phi(165°)	Phi(180°)	Phi(195°)	Phi(210°)	Phi(225°)	Phi(240°)	Phi(255°)	Phi(270°)	Phi(285°)	Phi(300°)	Phi(315°)	Phi(330°)	Phi(345°)
Gain	Phi(7.5°)	Phi(15°)	Phi(30°)	Phi(45°)	Phi(60°)	Phi(75°)	Phi(90°)	Phi(105°)	Phi(120°)	Phi(135°)	Phi(150°)	Phi(165°)	Phi(180°)	Phi(195°)	Phi(210°)	Phi(225°)	Phi(240°)	Phi(255°)	Phi(270°)	Phi(285°)	Phi(300°)	Phi(315°)	Phi(330°)	Phi(345°)
Gain	Phi(7.5°)	Phi(15°)	Phi(30°)	Phi(45°)	Phi(60°)	Phi(75°)	Phi(90°)	Phi(105°)	Phi(120°)	Phi(135°)	Phi(150°)	Phi(165°)	Phi(180°)	Phi(195°)	Phi(210°)	Phi(225°)	Phi(240°)	Phi(255°)	Phi(270°)	Phi(285°)	Phi(300°)	Phi(315°)	Phi(330°)	Phi(345°)
Gain	Phi(7.5°)	Phi(15°)	Phi(30°)	Phi(45°)	Phi(60°)	Phi(75°)	Phi(90°)	Phi(105°)	Phi(120°)	Phi(135°)	Phi(150°)	Phi(165°)	Phi(180°)	Phi(195°)	Phi(210°)	Phi(225°)	Phi(240°)	Phi(255°)	Phi(270°)	Phi(285°)	Phi(300°)	Phi(315°)	Phi(330°)	Phi(345°)
Gain	Phi(7.5°)	Phi(15°)	Phi(30°)	Phi(45°)	Phi(60°)	Phi(75°)	Phi(90°)	Phi(105°)	Phi(120°)	Phi(135°)	Phi(150°)	Phi(165°)	Phi(180°)	Phi(195°)	Phi(210°)	Phi(225°)	Phi(240°)	Phi(255°)	Phi(270°)	Phi(285°)	Phi(300°)	Phi(315°)	Phi(330°)	Phi(345°)



# Radiated Composite Gain Data of 2.4GHz&5GHz

# Appendix A

Theta	0(30°)	0(35°)	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°)																											
Gain	0.8202/4	-1.29/2.83	-3.36/3.33	-4.95/8.67	-14.8/17.46	-14.73/10.65	-6.51/4.64	-4.37/4.59	-4.59/4.17	-3.51/2.56	-1.54/0.57	0.35/1.07	1.28/1.63	2.21/9.9	0.66/2.34	-6.65/9.8	-12.52/9.36	-4.32/2.2	-1.41/0.79	0.23/0.99	1.6/2.1	2.61/2.73	2.49/2.19	1.62/0.95																								
Theta	0(30°)	0(35°)	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°)				
Gain	0.8202/4	-1.29/2.83	-3.36/3.33	-4.95/8.67	-14.8/17.46	-14.73/10.65	-6.51/4.64	-4.37/4.59	-4.59/4.17	-3.51/2.56	-1.54/0.57	0.35/1.07	1.28/1.63	2.21/9.9	0.66/2.34	-6.65/9.8	-12.52/9.36	-4.32/2.2	-1.41/0.79	0.23/0.99	1.6/2.1	2.61/2.73	2.49/2.19	1.62/0.95	0.8202/4	-1.29/2.83	-3.36/3.33	-4.95/8.67	-14.8/17.46	-14.73/10.65	-6.51/4.64	-4.37/4.59	-4.59/4.17	-3.51/2.56	-1.54/0.57	0.35/1.07	1.28/1.63	2.21/9.9	0.66/2.34	-6.65/9.8	-12.52/9.36	-4.32/2.2	-1.41/0.79	0.23/0.99	1.6/2.1	2.61/2.73	2.49/2.19	1.62/0.95





Radiated Composite Gain Data of 2.4GHz&5GHz

Appendix A

Main data table with columns for frequency, angle, and gain. It contains 27 rows of data for various frequencies and angles, with numerical values for gain in dB. Some cells contain red text like '3.292.85'.



# Radiated Composite Gain Data of 2.4GHz&5GHz

# Appendix A

Theta (deg)	-10.47:11.09	-15.67:18.13	-15.87:13.27	-12.32:12.72	-13.88:10.84	-9.59:14.18	-13.61:8.75	-7.07:6.48	-6.81:8.96	-12.61:14.36	-11.47:8.99	-10.01:14.25	-17.32:17.36	-16.14:14.75	-13.83:15.85	-17.72:19.79	-16.62:13.48	-11.29:9.09	-5.55:5.04	-5.41:5.48	-6.43:8.11	-8.52:6.45	-6.68:7.44	-8.14:9.34
Gain	0.00(0.00)	0.15(0.15)	0.30(0.30)	0.45(0.45)	0.60(0.60)	0.75(0.75)	0.90(0.90)	1.05(1.05)	1.20(1.20)	1.35(1.35)	1.50(1.50)	1.65(1.65)	1.80(1.80)	1.95(1.95)	2.10(2.10)	2.25(2.25)	2.40(2.40)	2.55(2.55)	2.70(2.70)	2.85(2.85)	3.00(3.00)	3.15(3.15)	3.30(3.30)	3.45(3.45)
Theta (deg)	0(0)	7.5(7.5)	15(15)	22.5(22.5)	30(30)	37.5(37.5)	45(45)	52.5(52.5)	60(60)	67.5(67.5)	75(75)	82.5(82.5)	90(90)	97.5(97.5)	105(105)	112.5(112.5)	120(120)	127.5(127.5)	135(135)	142.5(142.5)	150(150)	157.5(157.5)	165(165)	172.5(172.5)
Phi (deg)	0(0)	7.5(7.5)	15(15)	22.5(22.5)	30(30)	37.5(37.5)	45(45)	52.5(52.5)	60(60)	67.5(67.5)	75(75)	82.5(82.5)	90(90)	97.5(97.5)	105(105)	112.5(112.5)	120(120)	127.5(127.5)	135(135)	142.5(142.5)	150(150)	157.5(157.5)	165(165)	172.5(172.5)
Theta (deg)	0(0)	7.5(7.5)	15(15)	22.5(22.5)	30(30)	37.5(37.5)	45(45)	52.5(52.5)	60(60)	67.5(67.5)	75(75)	82.5(82.5)	90(90)	97.5(97.5)	105(105)	112.5(112.5)	120(120)	127.5(127.5)	135(135)	142.5(142.5)	150(150)	157.5(157.5)	165(165)	172.5(172.5)
Phi (deg)	0(0)	7.5(7.5)	15(15)	22.5(22.5)	30(30)	37.5(37.5)	45(45)	52.5(52.5)	60(60)	67.5(67.5)	75(75)	82.5(82.5)	90(90)	97.5(97.5)	105(105)	112.5(112.5)	120(120)	127.5(127.5)	135(135)	142.5(142.5)	150(150)	157.5(157.5)	165(165)	172.5(172.5)





Radiated Composite Gain Data of 2.4GHz&5GHz

Appendix A

Table with columns for Frequency (MHz), Gain (dBi), and various antenna configurations (Theta/Phi angles). The table contains numerical data for each configuration across a range of frequencies from 2.4GHz to 5GHz.











## Radiated Composite Gain Data of 6GHz

## Appendix B

Freq(Hz)	6.175G	6.475G	6.695G	6.995G
Ant. 1 Max Gain (dBi)	2.07	1.81	1.86	1.85
Ant. 2 Max Gain (dBi)	2.56	1.87	2.15	1.68
Ant. 3 Max Gain (dBi)	2.74	2.28	2.48	1.47
Ant. 4 Max Gain (dBi)	4.4	3.68	1.91	3.99
Ant. 1 Polarization/ $\theta(^{\circ})/\Phi(^{\circ})$	Theta/82.5/262.5	Theta/82.5/262.5	Theta/82.5/255	Theta/82.5/270
Ant. 2 Polarization/ $\theta(^{\circ})/\Phi(^{\circ})$	Theta/82.5/262.5	Theta/37.5/232.5	Theta/90/262.5	Theta/90/255
Ant. 3 Polarization/ $\theta(^{\circ})/\Phi(^{\circ})$	Phi/30/255	Phi/52.5/255	Phi/52.5/247.5	Phi/52.5/255
Ant. 4 Polarization/ $\theta(^{\circ})/\Phi(^{\circ})$	Theta/60/82.5	Theta/75/82.5	Theta/60/75	Theta/67.5/75
Max Gain (dBi)	4.4	3.68	2.48	3.99
DG [1SS] (dBi)	6.96	5.32	5.38	5
DG [2SS] (dBi)	4.4	3.68	2.48	3.99
DG [4SS] (dBi)	4.4	3.68	2.48	3.99

## DG 1SS Result

Freq(Hz)	6.175GPol.	Phi±	Φ(15°)Φ(22.5°)	Φ(30°)Φ(37.5°)	Φ(45°)Φ(52.5°)	Φ(60°)Φ(67.5°)	Φ(75°)Φ(82.5°)	Φ(90°)Φ(97.5°)	Φ(105°)Φ(112.5°)	Φ(120°)Φ(127.5°)	Φ(135°)Φ(142.5°)	Φ(150°)Φ(157.5°)	Φ(165°)Φ(172.5°)	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°)
DG(dB)	Φ(0°)Φ(7.5°)	Φ(15°)Φ(22.5°)	Φ(30°)Φ(37.5°)	Φ(45°)Φ(52.5°)	Φ(60°)Φ(67.5°)	Φ(75°)Φ(82.5°)	Φ(90°)Φ(97.5°)	Φ(105°)Φ(112.5°)	Φ(120°)Φ(127.5°)	Φ(135°)Φ(142.5°)	Φ(150°)Φ(157.5°)	Φ(165°)Φ(172.5°)	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(0°)	-5.11-4.86	-5.92-5.19	-3.86-2.91	-1.83-0.01	0.88-1.66	2.14-2.31	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	2.03-3.3	
Φ(7.5°)	-6.67-5.74	-4.64-4.96	-4.49-3.13	-2.19-1.24	0.02-1.24	1.92-2.4	2.31-5.2	2.83-1.3	3.11-2.7	2.11-5.3	0.98-0.2	-2.25-3.72	-4.31-4.14	-4.76-4.22	-3.08-2.02	-1.10-0.4	0.81-1	1.51-1.67	1.57-1.73	1.85-1.62	1.38-0.86	0.18-0.45	-1.43-2.83	-4.56-6.35	
Φ(15°)	-3.25-2.94	-2.65-2.51	-2.14-1.93	-1.47-0.43	0.31-0.65	1.21-1.9	2.19-2.45	2.62-9.2	2.71-8.8	0.68-0.69	-1.99-3.79	-5.59-6.08	-6.53-7.05	-6.36-5.82	-3.64-1.58	0.03-1.9	1.94-1.2	1.71-	0.03-0.94	-1.21-1.16	-0.78-0.84	-0.94-1.44	-1.87-1.88	-1.52-2.22	
Φ(22.5°)	-3.04-3.07	-2.66-2.63	-2.61-1.92	-0.54-0.94	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	2.02-2.1	







# Radiated Composite Gain Data of 6GHz

# Appendix B

## Gain Result

Freq(Hz)	6.175GPol.	PhiAnt.1	PhiAnt.2	PhiAnt.3	PhiAnt.4	PhiAnt.5	PhiAnt.6	PhiAnt.7	PhiAnt.8	PhiAnt.9	PhiAnt.10	PhiAnt.11	PhiAnt.12	PhiAnt.13	PhiAnt.14	PhiAnt.15	PhiAnt.16	PhiAnt.17	PhiAnt.18	PhiAnt.19	PhiAnt.20	PhiAnt.21	PhiAnt.22	PhiAnt.23	PhiAnt.24	PhiAnt.25	PhiAnt.26	PhiAnt.27	PhiAnt.28	PhiAnt.29	PhiAnt.30	PhiAnt.31	PhiAnt.32	PhiAnt.33	PhiAnt.34	PhiAnt.35															
Gain	Phi(7.5)	Phi(15)	Phi(30)	Phi(45)	Phi(60)	Phi(75)	Phi(90)	Phi(105)	Phi(120)	Phi(135)	Phi(150)	Phi(165)	Phi(180)	Phi(195)	Phi(210)	Phi(225)	Phi(240)	Phi(255)	Phi(270)	Phi(285)	Phi(300)	Phi(315)	Phi(330)	Phi(345)	Phi(360)	Phi(375)	Phi(390)	Phi(405)	Phi(420)	Phi(435)	Phi(450)	Phi(465)	Phi(480)	Phi(495)	Phi(510)	Phi(525)															
6.175GPol.	Theta(0)	Theta(7.5)	Theta(15)	Theta(22.5)	Theta(30)	Theta(37.5)	Theta(45)	Theta(52.5)	Theta(60)	Theta(67.5)	Theta(75)	Theta(82.5)	Theta(90)	Theta(97.5)	Theta(105)	Theta(112.5)	Theta(120)	Theta(127.5)	Theta(135)	Theta(142.5)	Theta(150)	Theta(157.5)	Theta(165)	Theta(172.5)	Theta(180)	Theta(187.5)	Theta(195)	Theta(202.5)	Theta(210)	Theta(217.5)	Theta(225)	Theta(232.5)	Theta(240)	Theta(247.5)	Theta(255)	Theta(262.5)	Theta(270)	Theta(277.5)	Theta(285)	Theta(292.5)	Theta(300)	Theta(307.5)	Theta(315)	Theta(322.5)	Theta(330)	Theta(337.5)	Theta(345)	Theta(352.5)			
Gain	Phi(7.5)	Phi(15)	Phi(30)	Phi(45)	Phi(60)	Phi(75)	Phi(90)	Phi(105)	Phi(120)	Phi(135)	Phi(150)	Phi(165)	Phi(180)	Phi(195)	Phi(210)	Phi(225)	Phi(240)	Phi(255)	Phi(270)	Phi(285)	Phi(300)	Phi(315)	Phi(330)	Phi(345)	Phi(360)	Phi(375)	Phi(390)	Phi(405)	Phi(420)	Phi(435)	Phi(450)	Phi(465)	Phi(480)	Phi(495)	Phi(510)	Phi(525)	Phi(540)	Phi(555)	Phi(570)	Phi(585)	Phi(600)	Phi(615)	Phi(630)	Phi(645)	Phi(660)	Phi(675)	Phi(690)	Phi(705)	Phi(720)	Phi(735)	Phi(750)
Gain	Phi(7.5)	Phi(15)	Phi(30)	Phi(45)	Phi(60)	Phi(75)	Phi(90)	Phi(105)	Phi(120)	Phi(135)	Phi(150)	Phi(165)	Phi(180)	Phi(195)	Phi(210)	Phi(225)	Phi(240)	Phi(255)	Phi(270)	Phi(285)	Phi(300)	Phi(315)	Phi(330)	Phi(345)	Phi(360)	Phi(375)	Phi(390)	Phi(405)	Phi(420)	Phi(435)	Phi(450)	Phi(465)	Phi(480)	Phi(495)	Phi(510)	Phi(525)	Phi(540)	Phi(555)	Phi(570)	Phi(585)	Phi(600)	Phi(615)	Phi(630)	Phi(645)	Phi(660)	Phi(675)	Phi(690)	Phi(705)	Phi(720)	Phi(735)	Phi(750)



# Radiated Composite Gain Data of 6GHz

# Appendix B

Frequency	Theta	Phi	Gain	Phi(15°)	Phi(22.5°)	Phi(30°)	Phi(37.5°)	Phi(45°)	Phi(52.5°)	Phi(60°)	Phi(67.5°)	Phi(75°)	Phi(82.5°)	Phi(90°)	Phi(97.5°)	Phi(105°)	Phi(112.5°)	Phi(120°)	Phi(127.5°)	Phi(135°)	Phi(142.5°)	Phi(150°)	Phi(157.5°)	Phi(165°)	Phi(172.5°)	Phi(180°)	Phi(187.5°)	Phi(195°)	Phi(202.5°)	Phi(210°)	Phi(217.5°)	Phi(225°)	Phi(232.5°)	Phi(240°)	Phi(247.5°)	Phi(255°)	Phi(262.5°)	Phi(270°)	Phi(277.5°)	Phi(285°)	Phi(292.5°)	Phi(300°)	Phi(307.5°)	Phi(315°)	Phi(322.5°)	Phi(330°)	Phi(337.5°)	Phi(345°)	Phi(352.5°)			
6.9950GHz	Theta(0°)	Phi(0°)	Gain	Phi(15°)	Phi(22.5°)	Phi(30°)	Phi(37.5°)	Phi(45°)	Phi(52.5°)	Phi(60°)	Phi(67.5°)	Phi(75°)	Phi(82.5°)	Phi(90°)	Phi(97.5°)	Phi(105°)	Phi(112.5°)	Phi(120°)	Phi(127.5°)	Phi(135°)	Phi(142.5°)	Phi(150°)	Phi(157.5°)	Phi(165°)	Phi(172.5°)	Phi(180°)	Phi(187.5°)	Phi(195°)	Phi(202.5°)	Phi(210°)	Phi(217.5°)	Phi(225°)	Phi(232.5°)	Phi(240°)	Phi(247.5°)	Phi(255°)	Phi(262.5°)	Phi(270°)	Phi(277.5°)	Phi(285°)	Phi(292.5°)	Phi(300°)	Phi(307.5°)	Phi(315°)	Phi(322.5°)	Phi(330°)	Phi(337.5°)	Phi(345°)	Phi(352.5°)			
			-15.11-17.25	-18.95-17.21	-18.89-18.33	-15.76-12.08	-10.29-9.97	-12.32-12.32	-9.51-6.78	-5.01-4.35	-4.25-6.41	-4.93-4.44	-6.01-7.08	-8.61-10.98	-15.86-18.34	-17.94-18.12	-18.46-17.92	-13.87-11.13	-8.15-6.56	-6.06-5.75	-4.63-3.78	-3.19-3.54	-4.68-5.74	-6.55-7.24	-7.35-7.36	-9.48-13.95																										





# Radiated Composite Gain Data of 6GHz

# Appendix B

Theta (°)	-16.71-19.07	-11.81-17.94	-18.22-14.32	-10.93-9.55	-9.17-8.19	-9.61-17.65	-18.81-13.08	-14.89-18.94	-16.77-10.34	-15.68-14.14	-7.81-13.64	-11.96-13.88	-10.67-11.62	-18.49-14.2	-13.88-18.18	-14.78-14.74	-14.25-15.74	-12.48-12.54	-9.71-13.13	-13.69-9.81	-7.68-17.86	-7.77-16.29	-17.59-19.15	-15.69-17.94
Gain	Phi(7°)Phi(7.5°)	Phi(15°)Phi(22.5°)	Phi(30°)Phi(37.5°)	Phi(45°)Phi(52.5°)	Phi(60°)Phi(67.5°)	Phi(75°)Phi(82.5°)	Phi(90°)Phi(97.5°)	Phi(105°)Phi(112.5°)	Phi(120°)Phi(127.5°)	Phi(135°)Phi(142.5°)	Phi(150°)Phi(157.5°)	Phi(165°)Phi(172.5°)	Phi(180°)Phi(187.5°)	Phi(195°)Phi(202.5°)	Phi(210°)Phi(217.5°)	Phi(225°)Phi(232.5°)	Phi(240°)Phi(247.5°)	Phi(255°)Phi(262.5°)	Phi(270°)Phi(277.5°)	Phi(285°)Phi(292.5°)	Phi(300°)Phi(307.5°)	Phi(315°)Phi(322.5°)	Phi(330°)Phi(337.5°)	Phi(345°)Phi(352.5°)
Theta (°)	-16.71-19.07	-11.81-17.94	-18.22-14.32	-10.93-9.55	-9.17-8.19	-9.61-17.65	-18.81-13.08	-14.89-18.94	-16.77-10.34	-15.68-14.14	-7.81-13.64	-11.96-13.88	-10.67-11.62	-18.49-14.2	-13.88-18.18	-14.78-14.74	-14.25-15.74	-12.48-12.54	-9.71-13.13	-13.69-9.81	-7.68-17.86	-7.77-16.29	-17.59-19.15	-15.69-17.94
Gain	Phi(7°)Phi(7.5°)	Phi(15°)Phi(22.5°)	Phi(30°)Phi(37.5°)	Phi(45°)Phi(52.5°)	Phi(60°)Phi(67.5°)	Phi(75°)Phi(82.5°)	Phi(90°)Phi(97.5°)	Phi(105°)Phi(112.5°)	Phi(120°)Phi(127.5°)	Phi(135°)Phi(142.5°)	Phi(150°)Phi(157.5°)	Phi(165°)Phi(172.5°)	Phi(180°)Phi(187.5°)	Phi(195°)Phi(202.5°)	Phi(210°)Phi(217.5°)	Phi(225°)Phi(232.5°)	Phi(240°)Phi(247.5°)	Phi(255°)Phi(262.5°)	Phi(270°)Phi(277.5°)	Phi(285°)Phi(292.5°)	Phi(300°)Phi(307.5°)	Phi(315°)Phi(322.5°)	Phi(330°)Phi(337.5°)	Phi(345°)Phi(352.5°)
Theta (°)	-16.71-19.07	-11.81-17.94	-18.22-14.32	-10.93-9.55	-9.17-8.19	-9.61-17.65	-18.81-13.08	-14.89-18.94	-16.77-10.34	-15.68-14.14	-7.81-13.64	-11.96-13.88	-10.67-11.62	-18.49-14.2	-13.88-18.18	-14.78-14.74	-14.25-15.74	-12.48-12.54	-9.71-13.13	-13.69-9.81	-7.68-17.86	-7.77-16.29	-17.59-19.15	-15.69-17.94







# Radiated Composite Gain Data of 6GHz

# Appendix B

Gain	Phi(0°)	Phi(7.5°)	Phi(15°)	Phi(22.5°)	Phi(30°)	Phi(37.5°)	Phi(45°)	Phi(52.5°)	Phi(60°)	Phi(67.5°)	Phi(75°)	Phi(82.5°)	Phi(90°)	Phi(97.5°)	Phi(105°)	Phi(112.5°)	Phi(120°)	Phi(127.5°)	Phi(135°)	Phi(142.5°)	Phi(150°)	Phi(157.5°)	Phi(165°)	Phi(172.5°)	Phi(180°)
Gain	Phi(0°)	Phi(7.5°)	Phi(15°)	Phi(22.5°)	Phi(30°)	Phi(37.5°)	Phi(45°)	Phi(52.5°)	Phi(60°)	Phi(67.5°)	Phi(75°)	Phi(82.5°)	Phi(90°)	Phi(97.5°)	Phi(105°)	Phi(112.5°)	Phi(120°)	Phi(127.5°)	Phi(135°)	Phi(142.5°)	Phi(150°)	Phi(157.5°)	Phi(165°)	Phi(172.5°)	Phi(180°)
Gain	Phi(0°)	Phi(7.5°)	Phi(15°)	Phi(22.5°)	Phi(30°)	Phi(37.5°)	Phi(45°)	Phi(52.5°)	Phi(60°)	Phi(67.5°)	Phi(75°)	Phi(82.5°)	Phi(90°)	Phi(97.5°)	Phi(105°)	Phi(112.5°)	Phi(120°)	Phi(127.5°)	Phi(135°)	Phi(142.5°)	Phi(150°)	Phi(157.5°)	Phi(165°)	Phi(172.5°)	Phi(180°)
Gain	Phi(0°)	Phi(7.5°)	Phi(15°)	Phi(22.5°)	Phi(30°)	Phi(37.5°)	Phi(45°)	Phi(52.5°)	Phi(60°)	Phi(67.5°)	Phi(75°)	Phi(82.5°)	Phi(90°)	Phi(97.5°)	Phi(105°)	Phi(112.5°)	Phi(120°)	Phi(127.5°)	Phi(135°)	Phi(142.5°)	Phi(150°)	Phi(157.5°)	Phi(165°)	Phi(172.5°)	Phi(180°)
Gain	Phi(0°)	Phi(7.5°)	Phi(15°)	Phi(22.5°)	Phi(30°)	Phi(37.5°)	Phi(45°)	Phi(52.5°)	Phi(60°)	Phi(67.5°)	Phi(75°)	Phi(82.5°)	Phi(90°)	Phi(97.5°)	Phi(105°)	Phi(112.5°)	Phi(120°)	Phi(127.5°)	Phi(135°)	Phi(142.5°)	Phi(150°)	Phi(157.5°)	Phi(165°)	Phi(172.5°)	Phi(180°)











# Antenna Pattern of 2.4GHz&5GHz

# Appendix C

Freq(Hz)	5.785GPol.	TotalAnt.2	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-			
Gain	Φ(0°)Φ(7.5°)	Φ(15°)Φ(22.5°)	Φ(30°)Φ(37.5°)	Φ(45°)Φ(52.5°)	Φ(60°)Φ(67.5°)	Φ(75°)Φ(82.5°)	Φ(90°)Φ(97.5°)	Φ(105°)Φ(112.5°)	Φ(120°)Φ(127.5°)	Φ(135°)Φ(142.5°)	Φ(150°)Φ(157.5°)	Φ(165°)Φ(172.5°)	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°)																	
0(0°)	1.85/1.61	1.30/1.34	1.30/1.44	1.19/0.57	0.87/1.02	0.85/1.09	1.16/0.92	1.05/1.05	0.76/0.91	0.87/1.01	0.95/0.93	0.95/1.08	1.06/1.21	1.09/1.02	1.36/1.21	1.22/1.43	1.26/1.00	1.38/1.65	1.47/1.39	1.48/1.44	1.56/1.56	1.61/1.63	1.37/1.20	1.51/1.94																	

