



Antenna Composite Gain Test Report

FCC ID	MSQ-RTBE6X00
Equipment	BE30000 Quad Band WiFi Router
Brand Name	ASUS
Model Name	BQ16 Pro
Applicant	ASUSTeK COMPUTER INC. 1F., No. 15, Lide Rd., Beitou, Taipei City 112, Taiwan
Sample Received	Jul. 31, 2023
Start Test Date	Aug. 22, 2023
Final Test Date	Aug. 23, 2023

Approved by: **Sam Chen**

Sporton International Inc. Hsinchu Laboratory

No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)



Table of Contents

History of this test report.....	3
1. Operation Mode and Antenna Information	4
2. Test Frequency	5
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	12
9. Test Setup	14
10. Test Equipment and Calibration Data	15
11. Test Results	16

1. Operation Mode and Antenna Information

Antenna Position	RF Port	Brand Name	Model Name	Ant. Type	Connector	Modes of Operation
2G5G Ant1	1	Walsin	RFDPA220510IMLB901	Dipole	I-PEX	2.4GHz, 5GHz UNII 1~3
2G5G Ant2	2	Walsin	RFDPA220513IMLB901	Dipole	I-PEX	2.4GHz, 5GHz UNII 1~3
2G5G Ant3	3	Walsin	RFPCA180916IMLB901	Dipole	I-PEX	2.4GHz, 5GHz UNII 1~3
2G5G Ant4	4	Walsin	RFPCA251813IMLB901	Dipole	I-PEX	2.4GHz, 5GHz UNII 1~3
6GL Ant1	3	Walsin	RFDPA100504IM6B901	Dipole	I-PEX	6GHz UNII 5~6
6GL Ant2	2	Walsin	RFDPA100514IM6B901	Dipole	I-PEX	6GHz UNII 5~6
6GL Ant3	1	Walsin	RFDPA100509IM6B901	Dipole	I-PEX	6GHz UNII 5~6
6GL Ant4	4	Walsin	RFDPA100507IM6B901	Dipole	I-PEX	6GHz UNII 5~6
6GH Ant1	2	Walsin	RFDPA100506IM6B901	Dipole	I-PEX	6GHz UNII 7~8
6GH Ant2	1	Walsin	RFDPA100506IM6B902	Dipole	I-PEX	6GHz UNII 7~8
6GH Ant3	3	Walsin	RFDPA100505IM6B901	Dipole	I-PEX	6GHz UNII 7~8
6GH Ant4	4	Walsin	RFDPA100512IM6B901	Dipole	I-PEX	6GHz UNII 7~8

Note:

2.4GHz and 5GHz Operation Mode (4TX/4RX)

2G5G Ant1~4 can be used as transmitting/receiving antenna.

2G5G Ant1~4 could transmit/receive simultaneously.

6GHz Operation Mode (4TX/4RX)

For UNII 5~6

6GL Ant1~4 can be used as transmitting/receiving antenna.

6GL Ant1~4 could transmit/receive simultaneously.

For UNII 7~8

6GH Ant1~4 can be used as transmitting/receiving antenna.

6GH Ant1~4 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

Testing Location		
Sporton International Inc. Hsinhua Laboratory		
<input checked="" type="checkbox"/>	HWA YA	ADD : No.13-1 & 14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333, Taiwan R.O.C.

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
Radiated	05CH03-HY	Rex Liao	23.5-24.5 / 40-50	Aug. 22, 2023 ~ Aug. 23, 2023

Note:

Testing Site Information

Brand Name: TDK

Dimension: 11m*6m*6m

Characteristic: Fully Anechoic Chamber

4. Test Facility and Configuration

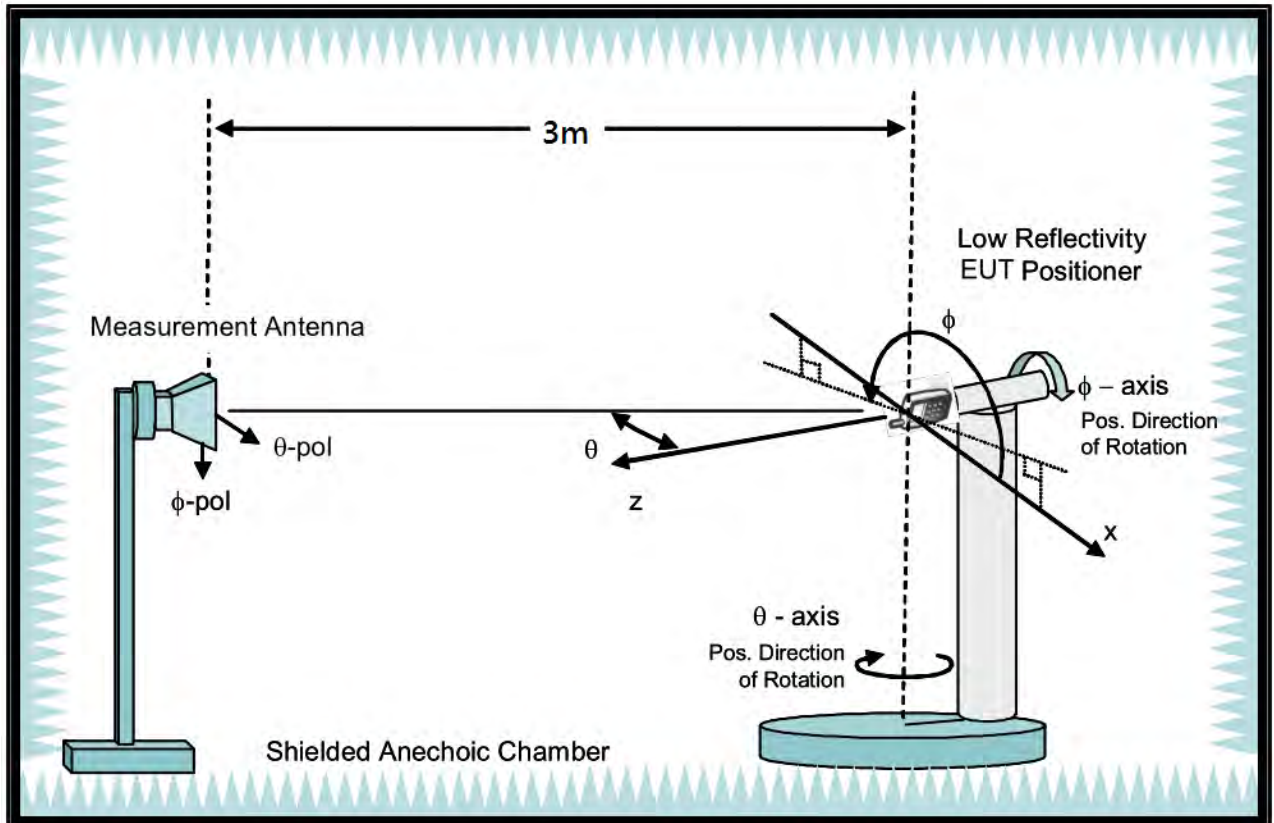
Test configuration: Reference to CITA OTA distributed-axes system configuration.

Chamber: Fully Anechoic Chamber.

Measurement antenna: Dual Polarization Horn antenna

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

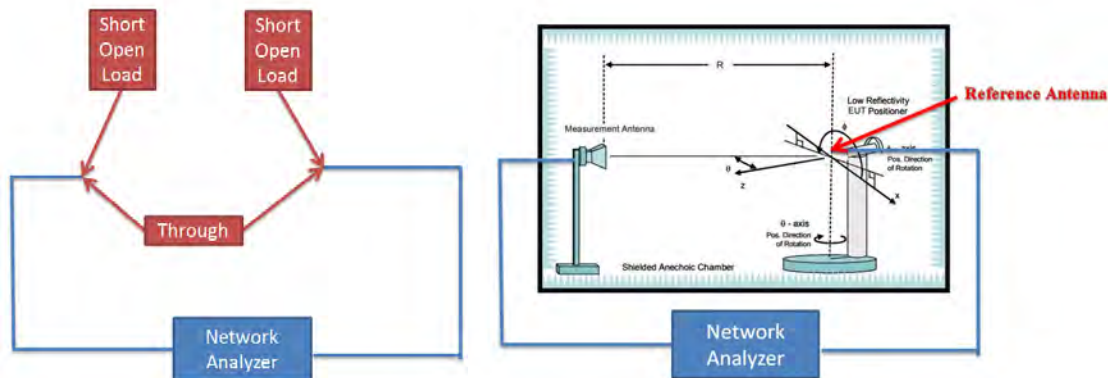
#Reference to CTIA "ctia-test-plan-for-wireless-device-over-the-air-performance-ver-3-7-1"



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

For 2G5G Ant1~4:

DG_1SS max value position

Frequency (Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 (dBi)	-8.31	2.1	0.96	2.31	2.25
Ant. 2 (dBi)	-8.19	2.28	1.43	1.43	1.97
Ant. 3 (dBi)	2.8	-8.03	-10.13	-12.24	-18.53
Ant. 4 (dBi)	1.88	-5.04	-2.45	-4.4	-2.3
DG [1SS] (dBi)	4.6	4.94	4.51	4.43	4.7
Polarization	Phi	Theta	Theta	Theta	Theta
$\Theta(^{\circ})$	60	105	105	105	105
$\Phi(^{\circ})$	142.5	187.5	187.5	195	195

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

DG_1SS max value position calculation

Frequency (Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 [$10^{(G/20)}$]	$10^{(-8.31/20)}$	$10^{(2.1/20)}$	$10^{(0.96/20)}$	$10^{(2.31/20)}$	$10^{(2.25/20)}$
Ant. 2 [$10^{(G/20)}$]	$10^{(-8.19/20)}$	$10^{(2.28/20)}$	$10^{(1.43/20)}$	$10^{(1.43/20)}$	$10^{(1.97/20)}$
Ant. 3 [$10^{(G/20)}$]	$10^{(2.8/20)}$	$10^{(-8.03/20)}$	$10^{(-10.13/20)}$	$10^{(-12.24/20)}$	$10^{(-18.53/20)}$
Ant. 4 [$10^{(G/20)}$]	$10^{(1.88/20)}$	$10^{(-5.04/20)}$	$10^{(-2.45/20)}$	$10^{(-4.4/20)}$	$10^{(-2.3/20)}$
Ant. 1 [$10^{(G/20)}$] value	0.384	1.274	1.117	1.305	1.296
Ant. 2 [$10^{(G/20)}$] value	0.389	1.3	1.179	1.179	1.255
Ant. 3 [$10^{(G/20)}$] value	1.38	0.397	0.312	0.244	0.118
Ant. 4 [$10^{(G/20)}$] value	1.242	0.56	0.754	0.603	0.767
Sum All Antenna [Amax]	3.396	3.53	3.362	3.331	3.436
DG [$10 \cdot \log(A_{max}^2/N_{ant})$]	4.6	4.94	4.51	4.43	4.7

Note:

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

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



For 6GL Ant1~4:

DG_1SS max value position

Frequency (Hz)	6.175G	6.475G
Ant. 1 (dBi)	-2.95	-0.59
Ant. 2 (dBi)	-1.18	-7.88
Ant. 3 (dBi)	0.79	2.37
Ant. 4 (dBi)	-5.41	-5.01
DG [1SS] (dBi)	4.13	4.12
Polarization	Theta	Theta
Θ (°)	60	135
Φ (°)	45	262.5

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)	6.175G	6.475G
Ant. 1 [10^(G/20)]	10^(-2.95/20)	10^(-0.59/20)
Ant. 2 [10^(G/20)]	10^(-1.18/20)	10^(-7.88/20)
Ant. 3 [10^(G/20)]	10^(0.79/20)	10^(2.37/20)
Ant. 4 [10^(G/20)]	10^(-5.41/20)	10^(-5.01/20)
Ant. 1 [10^(G/20)] value	0.712	0.934
Ant. 2 [10^(G/20)] value	0.873	0.404
Ant. 3 [10^(G/20)] value	1.095	1.314
Ant. 4 [10^(G/20)] value	0.536	0.562
Sum All Antenna [Amax]	3.217	3.213
DG [10*log(Amax^2/Nant)]	4.13	4.12

Note:

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

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



For 6GH Ant1~4:

DG_1SS max value position

Frequency (Hz)	6.695G	6.995G
Ant. 1 (dBi)	0.54	-2.65
Ant. 2 (dBi)	-9.72	-1.51
Ant. 3 (dBi)	3.71	-0.16
Ant. 4 (dBi)	-9.56	-0.59
DG [1SS] (dBi)	4.23	4.84
Polarization	Theta	Theta
Θ (°)	135	90
Φ (°)	262.5	120

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)	6.695G	6.995G
Ant. 1 [10^(G/20)]	10^(0.54/20)	10^(-2.65/20)
Ant. 2 [10^(G/20)]	10^(-9.72/20)	10^(-1.51/20)
Ant. 3 [10^(G/20)]	10^(3.71/20)	10^(-0.16/20)
Ant. 4 [10^(G/20)]	10^(-9.56/20)	10^(-0.59/20)
Ant. 1 [10^(G/20)] value	1.064	0.737
Ant. 2 [10^(G/20)] value	0.327	0.84
Ant. 3 [10^(G/20)] value	1.533	0.982
Ant. 4 [10^(G/20)] value	0.333	0.934
Sum All Antenna [Amax]	3.256	3.494
DG [10*log(Amax^2/Nant)]	4.23	4.84

Note:

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

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



8. Summary of Test Result

For 2G5G Ant1~4:

Freq(Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	2.48	2.1	2.16	2.31	2.3
Ant. 2 Max Gain (dBi)	2.46	3.09	3.47	2.84	3.65
Ant. 3 Max Gain (dBi)	2.8	2.67	2.36	2.36	2.39
Ant. 4 Max Gain (dBi)	2.04	2.15	2.42	2.5	2.01
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/105/157.5	Theta/105/187.5	Theta/90/60	Theta/105/195	Theta/105/202.5
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/105/225	Theta/120/277.5	Theta/120/277.5	Theta/97.5/315	Theta/120/277.5
Ant. 3 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Phi/60/142.5	Phi/90/165	Phi/90/165	Phi/90/97.5	Phi/97.5/90
Ant. 4 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Phi/67.5/127.5	Theta/82.5/202.5	Theta/82.5/210	Theta/75/172.5	Theta/75/172.5
Max Gain (dBi)	2.8	3.09	3.47	2.84	3.65
DG [1SS] (dBi)	4.6	4.94	4.51	4.43	4.7
DG [2SS] (dBi)	2.8	3.09	3.47	2.84	3.65
DG [4SS] (dBi)	2.8	3.09	3.47	2.84	3.65

For 6GL Ant1~4:

Frequency (Hz)	6.175G	6.475G
Ant. 1 Max Gain (dBi)	1.72	1.94
Ant. 2 Max Gain (dBi)	1.68	1.96
Ant. 3 Max Gain (dBi)	2.77	2.37
Ant. 4 Max Gain (dBi)	2.08	1.77
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Phi/82.5/187.5	Phi/97.5/157.5
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Phi/165/127.5	Theta/157.5/217.5
Ant. 3 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/135/262.5	Theta/135/262.5
Ant. 4 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/60/172.5	Theta/37.5/180
Max Gain (dBi)	2.77	2.37
DG [1SS] (dBi)	4.13	4.12
DG [2SS] (dBi)	2.77	2.37
DG [4SS] (dBi)	2.77	2.37



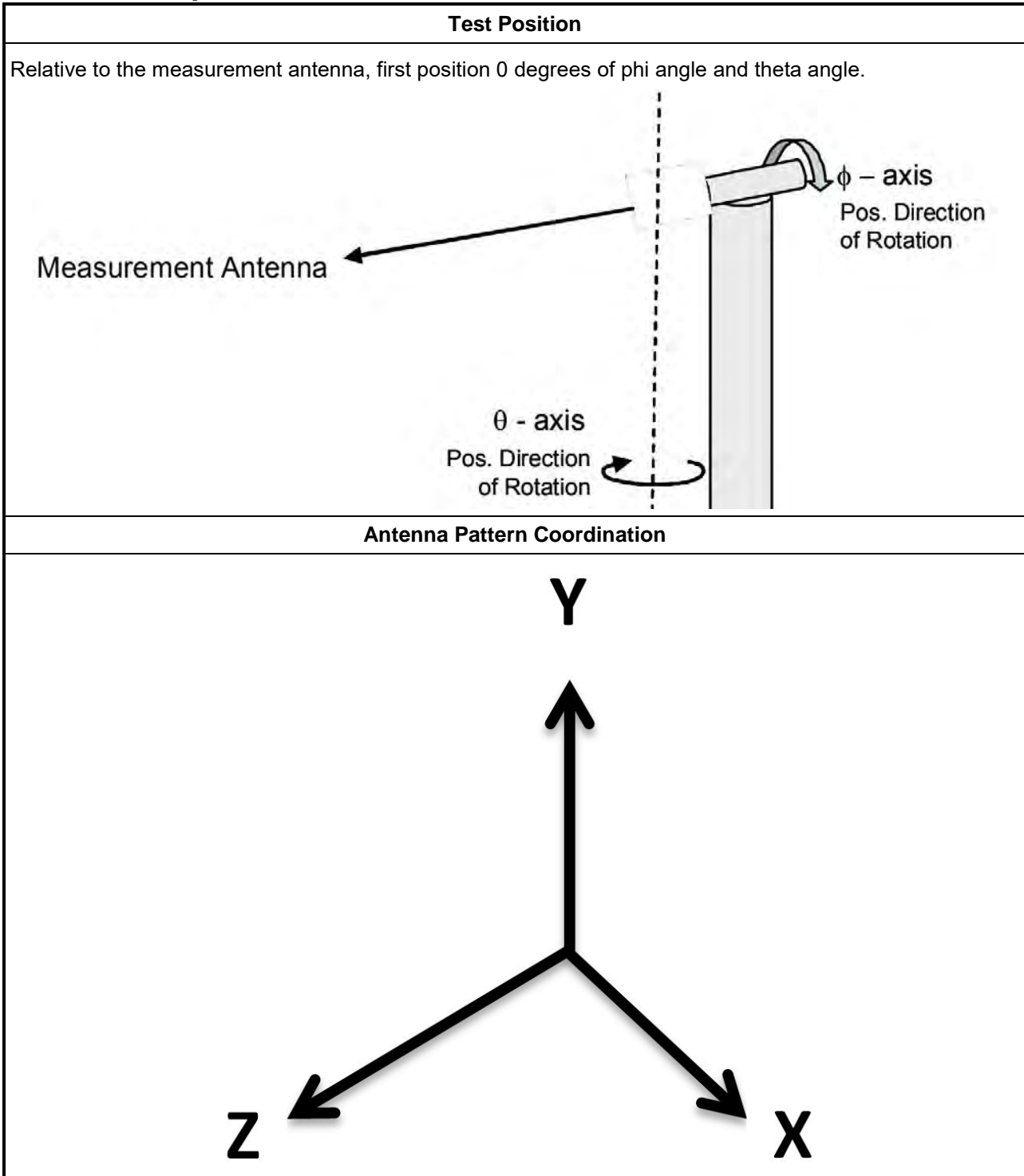
For 6GH Ant1~4:

Frequency (Hz)	6.695G	6.995G
Ant. 1 Max Gain (dBi)	2.27	1.82
Ant. 2 Max Gain (dBi)	1.52	1.7
Ant. 3 Max Gain (dBi)	3.71	3.4
Ant. 4 Max Gain (dBi)	2.11	2.23
Ant. 1 Polarization/ Θ (°)/ Φ (°)	Phi/75/180	Theta/112.5/217.5
Ant. 2 Polarization/ Θ (°)/ Φ (°)	Theta/60/345	Theta/97.5/270
Ant. 3 Polarization/ Θ (°)/ Φ (°)	Theta/135/262.5	Theta/135/262.5
Ant. 4 Polarization/ Θ (°)/ Φ (°)	Theta/37.5/157.5	Theta/37.5/172.5
Max Gain (dBi)	3.71	3.4
DG [1SS] (dBi)	4.23	4.84
DG [2SS] (dBi)	3.71	3.4
DG [4SS] (dBi)	3.71	3.4

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 and 5GHz UNII 1~3.....	Page 17
Appendix B – Radiated Composite Gain of 6GHz UNII 5~6.....	Page 31
Appendix C – Radiated Composite Gain of 6GHz UNII 7~8.....	Page 37
Appendix D – Antenna Pattern of 2.4GHz and 5GHz UNII 1~3.....	Page 43
Appendix E – Antenna Pattern of 6GHz UNII 5~6.....	Page 50
Appendix F – Antenna Pattern of 6GHz UNII 7~8.....	Page 54
Appendix G – Test Photos.....	Page 58



Freq(Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	2.48	2.1	2.16	2.31	2.3
Ant. 2 Max Gain (dBi)	2.46	3.09	3.47	2.84	3.65
Ant. 3 Max Gain (dBi)	2.8	2.67	2.36	2.36	2.39
Ant. 4 Max Gain (dBi)	2.04	2.15	2.42	2.5	2.01
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/105/157.5	Theta/105/187.5	Theta/90/60	Theta/105/195	Theta/105/202.5
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/105/225	Theta/120/277.5	Theta/120/277.5	Theta/97.5/315	Theta/120/277.5
Ant. 3 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Phi/60/142.5	Phi/90/165	Phi/90/165	Phi/90/97.5	Phi/97.5/90
Ant. 4 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Phi/67.5/127.5	Theta/82.5/202.5	Theta/82.5/210	Theta/75/172.5	Theta/75/172.5
Max Gain (dBi)	2.8	3.09	3.47	2.84	3.65
DG [1SS] (dBi)	4.6	4.94	4.51	4.43	4.7
DG [2SS] (dBi)	2.8	3.09	3.47	2.84	3.65
DG [4SS] (dBi)	2.8	3.09	3.47	2.84	3.65



Radiated Composite Gain of 2.4GHz and 5GHz UNII 1~3

Appendix A

Theta (°)	Phi (°)	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°)	
Theta (22.5°)	Phi (0°)	-3.76/5.14	-7.45/8.68	-8.37/7.06	-5.99/5.3	-5.27/4.89	-3.91/3.86	-3.26/2.9	-2.15/1.52	-1.07/0.93	-0.91/1.31	-1.21/2.81	-3.72/3.71	-3.5/3.3	-3.37/4.06	-4.8/5.4	-5.41/5.15	-4.72/4.33	-3.22/2.11	-1.47/1.21	-1.19/1.22	-1.03/0.85	-0.8/0.77	-0.96/1.53	-2.23/2.77
Theta (30°)	Phi (0°)	-6.11/7.76	-9.13/9.21	-8.41/1.39	-7.19/6.56	-6.82/6.13	-4.83/3.82	-2.76/2.17	-1.82/1.72	-1.73/1.68	-1.55/1.67	-2.34/3.4	-4.4/5.16	-5.35/4.18	-3.65/4.07	-4.53/4.61	-4.17/3.75	-3.25/3.04	-2.53/2.14	-1.74/1.35	-0.93/0.76	-1.17/1.43	-1.8/1.43	-1.78/1.19	-2.85/4.45
Theta (37.5°)	Phi (0°)	-7.13/8.6	-10.27/10.7	-10.01/10.39	-10.26/8.18	-5.99/4.29	-2.99/2	-1.52/1.61	-1.83/1.61	-1.32/1.06	-0.66/0.65	-1.42/2.84	-3.97/5.65	-5.33/4.16	-3.73/3.7	-3.67/3.29	-2.84/2.54	-3.3/4.9	-3.15/2.44	-1.77/1.46	-1.78/1.84	-1.25/1.03	-1.39/1.63	-2.13/2.77	-3.81/5.41
Theta (45°)	Phi (0°)	-6.03/7.07	-8.65/9.83	-8.91/6.02	-3.63/2.88	-2.43/1.91	-1.65/2	-2.16/2.37	-2.39/2.13	-2.27/2.26	-1.94/1.49	-1.28/1.75	-2.49/4.05	-4.71/4.8	-4.3/4.5	-4/2.87	-2.59/2.84	-2.29/1.13	-0.81/1.16	-0.98/0.72	-0.64/0.44	-0.54/0.74	-1.41/1.94	-2.3/3.49	-4.52/5.69
Theta (52.5°)	Phi (0°)	-5.62/7.42	-8.52/8.13	-6.15/5.05	-4.67/3.83	-4.14/3.97	-3.15/1.73	-1.45/1.76	-2.32/2.37	-2.7/3.08	-3.3/2.8	-1.21/2.13	-2.62/3.77	-4.86/4.89	-3.62/2.58	-1.53/1.71	-2.69/2.33	-2.19/2	-1.3/0.46	-0.31/0.42	-1.58/1.89	-0.180/36	0.44/0.27	-1.56/3.74	-4.84/5.47
Theta (60°)	Phi (0°)	-4.43/7.23	-8.83/7.95	-6.11/5.16	-3.42/3.22	-3.37/2.92	-2.14/1.09	-0.58/0.57	-0.69/1.37	-2.11/2.43	-3.65/4.17	-1.81/2.25	-3.32/4.25	-4.35/2.63	-2.52/2.98	-2.59/3.42	-3.3/2.94	-2.29/1.6	-0.73/0.74	-0.31/0.42	-1.58/1.89	-0.180/36	0.44/0.27	-1.56/3.74	-4.84/5.47
Theta (67.5°)	Phi (0°)	-5.77/6.93	-8.5/8.58	-5.9/4.49	-4.23/5.8	-5.05/4.17	-2.55/0.97	-0.37/0.45	-1.24/2.5	-3.05/2.91	-3.36/3.18	-3.61/2.41	-1.91/2.04	-2.28/2.72	-2.21/1.38	-1.19/0.84	-1.58/1.57	-2.14/2.76	-3.08/2.1	-1.82/1.45	-1.19/2.05	-2.43/1.74	-0.16/0.45	-1.59/2.87	-3.59/4.93
Theta (75°)	Phi (0°)	-5.83/7.74	-9.85/8.7	-4.7/3.61	-4.02/6.48	-5.39/4.42	-2.66/0.74	-0.07/0.59	-1.77/2.5	-3.02/3.14	-2.22/2.08	-1.25/2.27	-1.88/1.6	-2.35/2.54	-2.43/1.7	-1.59/1.05	-0.59/1.64	-3.2/2.77	-2.64/2.54	-1.9/1.68	-1.59/1.21	-1.91/3.69	-2.97/1.59	-1.89/3.86	-4.37/5.14
Theta (82.5°)	Phi (0°)	-6.58/9.57	-11.96/9.68	-6.57/5.36	-4.84/5.06	-4.53/3.44	-1.99/0.03	0.83/0.54	-0.66/2.67	-3.25/3.49	-2.56/1.4	-0.86/0.76	-0.93/1.9	-2.54/1.65	-0.55/1.47	-1.01/2.14	-2.27/3.98	-4.21/3.08	-2.32/2.48	-2.79/3.98	-3.27/2.37	-2.99/2.45	-2.3/2.45	-2.21/2.47	-3.8/5.85
Theta (90°)	Phi (0°)	-7.83/9.32	-10.31/7.89	-4.8/3.68	-4.82/4.48	-4.22/3.02	-1.5/0.59	0.390/9.5	0.19/1.31	-3.01/2.68	-1.7/1.47	-1.05/0.38	0.16/1.02	-2.04/2.45	-1.83/2.2	-3.67/3.75	-3.33/4.01	-4.58/4.11	-3.48/2.89	-3.12/1.66	-2.42/3.51	-3.05/1.63	-0.6/0.63	-1.68/3.4	-5.33/6.02
Theta (97.5°)	Phi (0°)	-5.71/6.29	-5.78/6.46	-6.76/7.19	-9.16/8.44	-4.82/3.49	-2.95/0.73	-0.45/0.94	-1.48/1.69	-2.53/2.54	-1.46/0.92	-1.26/1.27	-1.29/2.54	-2.76/2.49	-3.48/3.83	-5.31/6.18	-6.63/8.37	-8.11/5.54	-4.47/4.29	-1.61/1.48	-1.31/0.98	-1.35/1.17	-0.28/0.2	-1.06/2.21	-4.92/5.69
Theta (105°)	Phi (0°)	-3.39/4.39	-6.07/4.13	-2.02/1.07	-6.85/6.69	-5.14/3.26	-2.12/2.47	-3.03/3.38	-3.68/3.31	-2.99/2.58	-1.85/1.37	-1.9/2.4	-2.68/2.19	-2.97/4.03	-4.88/5.97	-6.52/7.66	-7.62/9.25	-6.23/5.12	-4.3/3.05	-3.25/2.46	-1.53/1.3	-2.12/1.52	-1.92/3.6	-4.91/4.86	
Theta (112.5°)	Phi (0°)	-4.18/6.75	-6.24/5.57	-4.74/4.26	-4.74/5.28	-4.42/4.25	-4.44/5.22	-5.08/4.57	-3.62/3.26	-3.41/3.1	-1.2/0.44	-1.05/2.94	-3.81/2.63	-1.95/2.36	-4.71/3.42	-3.34/5.81	-5.76/4.64	-6.51/6.2	-6.35/7.74	-4.57/5.23	-4.95/3.74	-1.99/2.88	-2.59/3.02	-4.24/5.76	-7.6/6.29
Theta (120°)	Phi (0°)	-6.06/6.95	-7.71/6.51	-5.25/6.79	-8.86/7.6	-5.2/3.77	-3.38/3	-3.87/4.8	-6.25/5.02	-2.48/1.72	-1.78/2.61	-1.86/1.8	-2.79/4.42	-3.3/3.02	-5.16/7.6	-5.75/4.87	-5.39/5.3	-7.5/5.22	-5.35/5.36	-2.41/3.72	-2.77/3.34	-5.16/5.15	-4.81/6.44	-6.69/9.2	
Theta (127.5°)	Phi (0°)	-8.12/6.94	-6.25/5.55	-6.38/4.47	-6.12/8.93	-11.08/8.52	-6.09/4.78	-4.7/4.65	-6.29/3.78	-2.52/2.13	-3.28/1.93	-0.77/0.74	-2.51/4.47	-3.83/2.67	-3.59/1.74	-4.23/5.12	-3.33/3.71	-5.11/5.36	-5.15/4.58	-6.01/5.05	-2.45/3.93	-3.67/2.91	-4.85/6.91	-9.66/3.22	-8.02/10.05
Theta (135°)	Phi (0°)	-10.02/9.97	-7.89/5.1	-5.63/5.75	-5.59/7.42	-10.47/10.38	-7.56/6.81	-5.86/4.93	-5.39/3.54	-1.61/1.81	-2.74/3.76	-3.38/2.2	-3.35/4.26	-6.01/5.39	-2.71/3.79	-4.08/5.5	-4.42/7.39	-5.53/5.13	-6.48/4.62	-5.4/5.61	-4.9/3.88	-4.95/2.43	-4.73/10.04	-10.53/9.78	-7.71/9.69
Theta (142.5°)	Phi (0°)	-7.2/7.15	-6.68/5.58	-5.39/6.26	-6.22/7.24	-8.01/8.07	-8.62/8.51	-7.92/6.15	-4.29/3.31	-2.8/2.77	-3.91/5.45	-5.06/3.73	-6.52/6.68	-7.63/7.12	-6.36/5.66	-4.67/6.41	-9.48/2.99	-6.73/9.3	-6.35/4.96	-4.35/3.33	-3.08/3.86	-8.36/6.33	-6.26/4.88	-5.73/9.31	-10.26/5
Theta (150°)	Phi (0°)	-4.82/6.04	-8.19/9.13	-9.31/9.07	-8.45/6.83	-6.32/5.65	-4.63/5.35	-6.42/7.65	-8.31/7.79	-7.59/7.35	-7.68/7.73	-6.26/6.94	-5.83/7	-9.71/10.4	-9.33/10.22	-6.55/7.7	-6.57/5	-6.95/8.07	-6.14/5.58	-7.46/9.06	-6.81/5.88	-7.41/9.2	-6.91/6.81	-6.62/7.52	-7.38/5.31
Theta (157.5°)	Phi (0°)	-7.11/7.06	-7.17/7.11	-7.15/7.47	-7.51/7.34	-6.6/5.29	-5.13/6.29	-7.6/8.54	-9.97/11.34	-10.76/9.87	-8.86/8.87	-7.65/6.96	-7.53/7.82	-7.75/6.68	-6.28/6.15	-6.14/6.6	-8.51/9.52	-6.09/4.84	-5.63/7.32	-7.67/5.92	-4.92/4.55	-4.48/4.48	-4.67/4.54	-4.72/5.81	-6.96/7
Theta (165°)	Phi (0°)	-7.05/6.75	-6.81/7.81	-9.51/10.92	-9.71/8.66	-8.11/7.46	-7.77/8.01	-8.54/8.53	-8.83/9.34	-9.48/7.77	-9.55/9.79	-9.37/8.74	-8.78/7.87	-6.8/5.61	-5.08/5.4	-5.81/6.29	-4.66/5.12	-3.71/3.32	-3.83/5.5	-6.52/6.94	-6.05/6.42	-3.49/3.24	-3.8/5.09	-6.64/8.12	-8.69/8.34
Theta (172.5°)	Phi (0°)	-11.59/11.65	-12.01/12.54	-12.31/12.45	-11.26/11.34	-10.86/10.44	-10.41/10.43	-11.03/11.6	-12.09/11.74	-10.49/9.93	-9.02/9.13	-9.19/9.18	-8.48/7.91	-7.99/8.07	-7.88/7.7	-7.67/7.51	-7.62/8.12	-9.9/9.94	-9.05/8.29	-7.68/7.22	-7.09/7.79	-8.82/10.45	-11.23/12.42	-12.29/12.07	
Theta (180°)	Phi (0°)	-11.17/11.53	-11.1/10.54	-10.47/9.91	-9.8/8.33	-7.99/7.33	-6.93/7.21	-6.93/7.21	-7.87/8.78	-9.2/10.05	-10.36/11.22	-11.55/11.8	-11.76/11.41	-11.53/11.57	-11.84/12.15	-11.8/11.38	-11.72/12.07	-11.84/12.34	-11.9/12.68	-12.02/12.75	-12.31/12.74	-11.76/11.25	-11.59/11.96	-12.11/12.62	
Phi (0°)	Phi (0°)	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 (0°)	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 (15°)	-2.51/1.98	-1.54/1.32	-1.15/1.09	-0.93/0.92	-1.19/1.37	-1.68/2.69	-3.45/3.33	-4.52/4.79	-4.54/4.12	-3.69/3.26	-2.99/3.1	-2.76/2.45	-2.03/1.59	-1.43/1.28	-1.37/1.45	-1.46/2.07	-2.69/3.26	-3.84/4.29	-4.57/5.01	-5.23/5.75	-5.3/5.2	-5.47/5.06	-4.57/4.01	-3.39/3.03	
Phi (30°)	-2.42/2.05	-1.84/1.77	-1.63/1.8	-1.94/1.98	-2.25/2.8	-3.06/3.79	-4.64/5.53	-5.66/5.84	-6.72/6.35	-5.62/6.72	-4.49/4.28	-3.96/3.53	-2.87/2.1	-1.35/0.94	-0.35/0.1	0.26/0.09	0.46/1.29	-2.5/3.38	-3.52/3.48	-3.9/4.12	-3.82/3.69	-3.86/3.43	-2.97/2.77	-2.67/2.28	
Phi (45°)	-2.36/2.5	-2.15/2.25	-2.35/2.42	-2.67/2.71	-2.78/3.23	-3.19/3.14	-3.67/4.15	-5.06/5.46	-6.08/6.1	-5.76/5.55	-5.66/5.63	-5.74/3.73	-3.29/2.29	-1.23/0.31	0.29/0.83	0.89/0.38	-0.49/1.4	-2.45/3.25	-3.57/3.91	-3.95/3.93	-3.28/2.46	-1.87/1.58	-1.98/2.21	-1.98/2.21	
Phi (60°)	-2.73/3.09	-3.01/2.54	-2.34/2.8	-3.54/3.62	-3.16/3.24	-3.35/2.96	-2.93/2.88	-2.95/3.04	-3.37/3.89	-3.86/3.69	-3.69/4.14	-4.2/3.78	-3/2.26	-1.02/0.51	0.04/0.04	-0.34/0.74	-1.12/1.61	-2.12/2.51	-2.51/2.2	-2/2.14	-2.76/3.58	-4.27/4.19	-3.15/2.25	-2.03/2.39	
Phi (75°)	-2.82/3.93	-4.14/4.03	-4.14/3.6	-3.58/3.78	-4.14/4.95	-5.13/5.09	-4.65/3.89	-3.28/2.61	-2.34/2.29	-2.2/2.31	-2.57/3.15	-3.26/2.99	-2.74/2.18	-1.73/1.56	-1.38/1.28	-1.18/0.93	-0.72/0.35	-0.46/0.73	-1.21/1.45	-1/0.79	-1.37/1.21	-2.84/3.58	-4.26/3.65	-2.64/2.15	
Phi (90°)	-4.12/4.94	-4.97/4.47	-3.9/3.1	-3.83/4.77	-5.08/5.11	-4.9/4.59	-4.39/3.67	-2.71/1.76	-1.49/1.95	-2.53/2.56	-2.64/3.05	-3.14/2.52	-2.62/2.17	-1.97/2.38	-2.5/2.01	-1.68/1.75	-1.72/1.31	-1.14/1.89	-2.49/3.05	-3.16/3.38	-3.34/3.4	-3.65/3.79	-3.44/3.23		
Phi (105°)	-2.92/4.94	-5.95/5.58	-3.63/3.2	-3.31/4.46	-4.93/4.99	-4.84/4.35	-4.03/3.68	-3.02/2.19	-1.55/1.57	-1.85/2.24	-1.99/2.04	-1.88/1.32	-1.95/2.16	-1.91/2.29	-2.76/3.32	-2.87/2.4	-2.55/2.33	-1.87/2.22	-2.59/2.67	-2.98/3.35	-3.89/4.64	-4.58/4.3	-3.57/3.9	-2.81/8.3	
Phi (120°)	-1.12/4.65	-5.69/3.78	-2.89/3.41	-2.77/3.54	-3.87/4.26	-4.48/4.22	-4.59/4.33	-2.67/1.41	-0.52/0.49	-0.85/1.95	-2.18/1.77	-1.1/0.48	-0.46/0.5	-0.79/0.73	-1.48/1.73	-1.51									



Radiated Composite Gain of 2.4GHz and 5GHz UNII 1~3

Appendix A

Theta (°)	-3.82/4.8	-6.16/6.68	-5.28/5.34	-5.62/5.38	-4.38/2.81	-1.17/0.08	-0.16/-1	-1.67/1.36	-1.17/1.53	-1.66/1.87	-3.37/3.57	-3.23/2.97	-3.05/2.89	-2.57/2.82	-3.34/3.7	-4.41/4.46	-5.09/5.88	-4.95/2.98	-1.66/0.79	-1.05/2.96	-1.19/0.78	1.47/0.34	-3.4/4.15	-4.45/5.29																								
Theta (67.5°)	-3.12/4.16	-5.46/5.87	-3.83/3.28	-4.35/4.66	-3.16/2.1	-1.04/0.6	1.19/0.71	-0.18/1.1	-1.01/1.93	-1.92/2.78	-4.57/4.09	-2.91/3.78	-3.73/2.42	-1.62/2.23	-2.84/3.2	-3.69/3.91	-5.28/3.97	-2.39/1.71	-2.02/2.49	-2.74/3.27	-3.44/1.04	-0.61/1.52	-3.05/4.58	-3.16/4.52																								
Theta (75°)	-3.49/5.92	-7.94/9.02	-8.06/6.88	-7.47/6.1	-4.46/1.95	-0.31/0.94	1.47/1.13	-0.53/1.84	-2.13/2.77	-2.87/1.68	-3.03/4.43	-3.91/4.31	-4.59/3.1	-2.8/3.96	-3.83/3.8	-3.18/2.49	-3.2/3.12	-2.96/2.39	-1.62/1.73	-3.37/3.13	-2.47/1.89	-0.79/2.23	-4.11/3.11	-2.65/3.01																								
Theta (82.5°)	-4.85/7.63	-10.1/8.65	-7.27/6.76	-5.44/3.61	-2.47/1.13	0.08/1.66	2.24/1.45	-0.38/2.83	-4.12/3.66	-3.43/1.44	-2.22/2.34	-2.19/3.79	-4.15/3.83	-3.4/3.45	-2.68/2.61	-2.16/2.52	-3.5/2.5	-2.13/2.96	-2.58/1.73	-1.53/1.23	-1.65/1.6	-2.49/3.53	-2.12/1.67	-3.74/4.74																								
Theta (90°)	-4.56/6.23	-9.25/8.32	-8.61/6.62	-6.09/5.57	-4.4/1.54	1.05/2.25	2.67/1.88	-0.39/1.78	-2.92/2.9	-2.65/2.76	-1.6/0.59	-2.24/2.99	-3.28/3.62	-2.14/1.86	-3.72/3.37	-2.71/3.4	-4.74/3.66	-4.35/2.24	-1.57/1.6	-1.96/1.11	-0.38/1.15	-0.87/1.36	-1.29/2.01	-4.4/6.37																								
Theta (97.5°)	-4.02/4.62	-5.6/5.16	-6.53/6.8	-6.68/5.38	-3.64/2.43	0.19/1.6	2.14/0.73	-0.64/1.54	-2.43/2.04	-2.1/2.55	-2.78/1.87	-2.11/2.07	-0.81/1.61	-0.56/1.55	-2.77/5.4	-5.65/3.64	-7.19/6.36	-4.11/2.19	-1.71/1.21	-1.83/0.24	0.50/5.7	-0.46/1.4	-1.77/2.18	-4.82/4.45																								
Theta (105°)	-4.23/3.46	-3.18/4.47	-4.73/4.1	-6.27/6.76	-3.64/1.41	-1.19/0.28	-0.15/1.48	-2.84/3.68	-2.8/1.82	-1.98/2.07	-2.91/3.41	-2.74/1.82	-1.5/1.59	-2.27/2.49	-3.16/3.93	-4.22/4.67	-5.97/6.01	-1.99/0.81	-1.34/0.49	-2.19/2.26	-0.85/1.41	-2.81/2.07	-2.29/3.69	-4.88/5.81																								
Theta (112.5°)	-5.26/4.18	-4.83/5.75	-5.05/4.12	-4.75/5.76	-5.41/4.45	-3.74/3.95	-3.97/2.98	-3.4/4.18	-2.8/0.91	-0.35/0.92	-2.6/3.35	-4.43/4.1	-2.62/2.24	-3.69/3.79	-4.87/3.42	-4.3/1.58	-3.11/4.17	-3.12/4.15	-2.5/1.74	-6.06/5.37	-2.87/2.23	-1.64/0.62	-2.23/5.21	-5.01/7.89																								
Theta (120°)	-3.76/4.61	-4.87/6.3	-5.14/3.9	-3.15/4.12	-6.66/5.27	-3.97/2.83	-2.8/3.4	-4.42/3.7	-3.12/1.5	-1.31/1.81	-1.95/0.34	-1/3.51	-3.85/2.51	-4.08/3.02	-3.28/6.44	-5.01/3.67	-3.4/2.74	-4.5/8.46	-4.8/4.47	-5.69/5.37	-3.29/2.8	-3.4/3.4	-5.46/5.37	-7.37/6.1																								
Theta (127.5°)	-5.52/6.12	-5.2/5.48	-6.49/8.1	-8.2/6.09	-4.35/4.28	-3.1/2.27	-2.54/4.29	-4.93/4.34	-4.59/4.24	-3.96/3.02	-1.63/2.08	-3.26/5.37	-4.27/5.61	-6.77/5.02	-4.96/6.64	-5.85/6.13	-5.97/3.45	-4.92/4.74	-5.48/5.23	-4.85/5.34	-4.2/3.03	-4.8/6.84	-9.62/8.95	-8.36/7.9																								
Theta (135°)	-6.01/5.92	-5/4.79	-5.42/7.63	-8.61/8.55	-8.21/5.27	-3.36/2.97	-2.9/3.45	-3.89/4.27	-5.47/5.34	-5.62/5.06	-4.06/2.19	-2.23/4.87	-6.25/4.87	-3.48/3.16	-5.6/7.11	-7.8/8.58	-5.76/6.15	-4.03/4.77	-6.27/5.48	-4.89/7.66	-9.43/4.28	-5.22/6.92	-7.13/9.21	-11.78/7.9																								
Theta (142.5°)	-6.78/6.03	-5.66/7.56	-9.55/9.77	-8.7/6.12	-4.64/4.32	-4.27/3.7	-4.28/4.05	-4/4.29	-5.13/5.92	-6.2/5.61	-4.93/3.94	-4.12/5.33	-7.56/8.46	-7.19/7.04	-5.75/5.58	-9.09/11.53	-10.61/8.27	-6.81/7.76	-8.35/7.54	-5.63/5.73	-6.94/7.74	-7.58/8.27	-8.34/9.23	-9.34/7.77																								
Theta (150°)	-5.62/7.23	-9.8/11.94	-8.91/9.42	-10.55/8.59	-5.23/3.54	-3.36/3.92	-5.19/6.94	-8.3/9.27	-9.02/6.68	-4.79/3.94	-4/5.07	-5.93/5.53	-6.23/7.07	-6.15/6.86	-7.61/8.21	-8.67/7.87	-7.82/5.15	-4.73/5.9	-7.35/5.92	-5.22/5.17	-7.06/7.52	-6.43/5.91	-5.78/6.05	-6.3/4.83																								
Theta (157.5°)	-5.99/7.22	-8.26/6.65	-5.56/6.24	-8.06/8.02	-6.77/5.73	-6.43/8.37	-10.73/11.74	-10.54/8.39	-5.62/4.31	-3.38/2.83	-2.63/3.6	-4.83/6.68	-8.85/8.23	-8.27/10.71	-12.52/12.11	-11.25/10.94	-9.04/6.15	-5.22/5.99	-8.38/8.59	-7.03/6.16	-7.16/7.64	-7.4/6.25	-4.92/4.87	-5.72/5.56																								
Theta (165°)	-8.42/8.47	-7.03/5.28	-4.56/4.52	-4.95/6.01	-7.02/8.16	-8.55/9.09	-8.38/8.02	-8.03/7.66	-6.8/7.39	-7.26/6.52	-5.64/5.67	-6.34/7.59	-8.67/8.78	-7.94/7.14	-7.25/8.23	-8.83/8.21	-6.79/5.54	-5.79/7.6	-8.75/10.14	-9.74/7.79	-7.54/6.89	-6.8/7.49	-8.5/8.78	-8.92/8.72																								
Theta (172.5°)	-12.59/11.16	-9.54/8.36	-8.05/7.44	-7.54/7.71	-8.56/9.06	-9.65/10.31	-11.24/11.94	-11.62/10.6	-10.16/8.6	-7.5/7.32	-6.8/6.17	-6.27/6.32	-6.24/6.21	-6.42/7.04	-8.01/7.45	-6.34/5.83	-5.41/5.81	-6.91/8.35	-9.43/8.98	-8.82/8.68	-8.66/9.31	-10.33/10.8	-11.7/12.27	-12.36/12.59																								
Theta (180°)	-11.53/11.06	-11.42/11.27	-12.19/11.84	-11.39/11.28	-10.13/9.67	-9.58/9.57	-10.09/10.96	-10.55/10.24	-9.95/9.7	-9.4/9.63	-9.91/10.66	-11.47/11.88	-10.93/11.34	-11.14/11.34	-11.29/10.55	-9.93/9.55	-9.1/9.17	-9.64/10.1	-10.37/10.52	-10.73/11.05	-10.86/11.53	-11.99/12.65	-12.87/12.04	-11/11.58																								
Freq(Hz)	5.785GHz																																															
DG(dB)	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°)	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 (0°)	-0.67/0.61	-0.58/0.36	0.34/0.44	-0.65/1	-1.68/2.23	-3.24/4.51	5.42/5.85	5.89/5.52	-5.26/4.51	-3.83/3.16	-2.47/1.66	-1/0.66	-0.37/0.11	0.04/0.13	-0.32/0.7	-1.1/1.57	-2.14/3.15	-4.14/4.85	-5.33/5.35	-5.43/5.49	-5.26/5.24	-4.59/3.58	-2.48/1.64	-1.32/0.99																								
Theta (7.5°)	-0.05/0.02	0.08/0.26	-0.53/0.89	-1.39/1.67	-2.24/2.63	-3.19/3.95	-4.41/4.86	-5.12/5	-4.99/5.15	-4.83/4.22	-3.53/2.56	-1.88/1.29	-0.8/0.36	-0.06/0.33	-0.63/1.1	-1.74/2.25	-2.71/3	-3.56/4.78	-5.26/5.78	-6.04/5.62	-4.73/3.88	-2.97/2.07	-1.22/0.7	-0.78/0.32																								
Theta (15°)	0.63/0.48	0.15/0.31	-1.09/1.61	-1.93/1.71	-2.03/2.24	-2.5/2.72	-3.14/3.39	-3.57/3.54	-3.87/4.58	-5.36/5.47	-4.85/4.1	-3.54/3.15	-2.67/2.29	-2.38/2.42	-2.41/2.02	-1.59/1.15	-1.05/1.2	-1.37/1.78	-2.41/2.83	-3.08/3.4	-3.65/3.64	-3.19/2.62	-1.57/0.9	-0.11/0.36																								
Theta (22.5°)	0.45/0.06	-0.48/0.92	-1.22/0.91	-1.07/1.61	-2.04/1.79	-1.61/1.49	-1.21/1.16	-0.91/0.72	-0.67/1.21	-2.1/2.9	-2.86/2.47	-2.34/2.6	-2.8/2.52	-2.25/1.66	-1.19/0.7	-0.29/0.04	0.01/0.07	0.02/0.07	-0.32/0.22	-0.14/0.17	-0.42/0.88	-1.69/2.2	-1.91/0.99	-0.80/0.36																								
Theta (30°)	0.87/1.01	0.28/0.55	-0.72/0.93	-1.62/2.16	-1.96/1.73	-1.33/0.88	-0.84/0.57	-0.22/0.1	-0.48/1.17	-1.51/1.89	-1.89/1.46	-1.22/1.28	-1/0.36	0.22/0.29	-0.05/0.32	-0.44/0.66	-1.2/0.98	-0.49/0.29	-0.17/0.19	0.1/0.03	0.35/0.82	0.64/0.28	-0.15/0.15	0.53/0.67																								
Theta (37.5°)	0.79/0.16	-0.6/1.4	-1.35/1.45	-1.55/1.1	-0.79/0.38	0.27/0.83	0.92/0.23	-0.65/1.46	-2.16/2.77	-3.1/3.07	-2.41/1.59	-1.57/1.61	-0.97/0.51	-0.09/0.48	0.31/0.65	-0.92/1.54	-2.33/1.78	-0.6/0.26	-0.05/0.86	1.09/0.84	0.31/0.07	0.52/0.46	0.46/0.8	1.03/1.26																								
Theta (45°)	0.17/1.14	-2.71/3.08	-2.81/2.61	-2.77/1.58	-0.77/0.03	0.48/0.31	0.11/0.16	-0.41/1.03	-1.49/1.77	-1.97/2.18	-1.25/0.22	-0.43/1.52	-1.41/0.18	0.31/1.11	1.65/0.68	0.04/0.8	-1.68/1.71	-1.82/1.72	-0.37/0.21	0.09/0.3	0.1/0.53	-2.12/2.39	-1.64/0.67	-0.25/0.38																								
Theta (52.5°)	-0.59/1.49	-2.38/5.01	6.22/5	-5.16/4.26	-3.57/2.55	-1.89/1.56	-1.73/2.62	-2.73/2.34	-2.13/2.12	-2.26/1.74	-0.63/0.5	0.51/0.75	-1.45/0.44	0.40/3.2	0.49/0.79	-0.99/1.19	-3.09/4.38	-2.68/1.82	-1.99/1.67	-1.54/1.57	-2.09/2.89	-3.54/3.94	-4.2/2.04	0.25/0.51																								
Theta (60°)	0.81/0.36	-0.32/2.54	-2.23/1.22	-3.01/4.36	-3.82/2.56	-2.55/2.88	-1.3/0.69	-0.66/0.21	0.74/0.14	-1.03/1.1	-0.39/0.78	1.38/0.1	-2.3/1.07	0.35/0.56	0.99/0.65	-0.71/2.78	-2.82/2.92	-1.79/1.84	-1.58/1.12	-2.49/3.63	-4.22/4.07	-3.42/3.45	-5.82/4.63	0.35/2.06																								
Theta (67.5°)	2.05/0	-0.27/1.6	-1.14/0.01	-1.27/1.33	-0.68/0.38	-1.13/2.31	-2.63/2.33	-1.38/0.18	0.88/0.72	0.02/0.32	0.62/1.08	1.6/0.23	-0.89/0.18	0.86/0.83	1.31/0.42	-0.74/1.88	-3.13/2.69	-2.53/1.79	-1.73/2.11	-2.84/2.79	-2.61/3.96	-4.02/2.46	-3.72/4.77	-0.44/2.81																								
Theta (75°)	2.58/0.17	-0.64/0.82	-1.62/1.1	-1.64/1.67	-1.38/0.51	-1.23/2.58	-3.6/3.37	-2.79/1.61	-1.12/1.1	-0.97/0.48	0.71/2.7	1.88/2.6	1.21/0.64	1.61/1.19	0.68/0.54	-0.02/1.87	-3.88/3.95	-6.11/4.29	-5.28/4.6	-4.07/3.03	-2.93/2.88	-2.69/3.74	-2.11/0.59	-0.162/38																								
Theta (82.5°)	1.08/0.58	-0.36/1.47	-1.99/0.37	-1.34/0.51	-0.9/0.99	-1.19/2.02	-3.27/4.18	-4.02/3.2	-2.29/1.6	-2.02/0.33	1.36/1.55	1.76/1.77	1.43/1.94	1.19/0.02	-0.91/0.29	-0.34/1.15	-2.59/2.07	-2.54/2.85	-2.64/1.13	-2.26/2.6	-0.92/0.28	-1.55/2.69	-2.85/0.16	2.47/2.31																								
Theta (90°)	-2.04/1.31	0.03/2.16	-1.72/1.98	-1.56/0.75	-1.55/1.87	-2.34/2.52	-4.46/4.23	-4.06/2.49	-2.49/1.41	-0.05/0.4	1.03/0.95	2.16/2.08	1.85/3.9	2.59/1.89	-0.72/0.44	-1.42/0.3	-1.24/2.05	-2.63/2.85	-4.99/1.79	-1.45/3.07	0.65/1.6	0.79/0.25	-0.73/1.32	0.84/0.61																								
Theta (97.5°)	-3.54/1.93	-0.89/2.93	-2.13/0.34	-0.19/0.72	-1.67/1.97	-3.51/3.87	-3.66/2.77	-2.9/2.11	-2.33/1.49	0.68/1.2	1.31/1.27	1.68/2.46	3.05/3.7	2.82/2.94	0.39/0.33	-0.56/0.96	0.19/4.18	-5.45/2.96	-4.0																													



Radiated Composite Gain of 2.4GHz and 5GHz UNII 1~3

Appendix A

Theta (°)	-11.32/-12.82	-14.72/-17	-18.48/-19.99	-17.99/-19.24	-18.01/-19.04	-17.71/-17.25	-17.51/-18.99	-19.01/-16.88	-17.21/-18.45	-18.39/-18.2	-19.18/-17.22	-16.63/-12.77	-11.41/-11.18	-12.21/-13.95	-17.15/-19.21	-18.71/-18.66	-17.93/-19.36	-18.11/-18.37	-18.16/-17.79	-18.33/-19.28	-16.48/-12.94	-11.33/-10.11	-9.79/-9.38	-9.38/-9.74
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°)
Φ(0°)	-18.26/-18.14	-18.64/-17.6	-15.79/-15.05	-13.73/-12.05	-10.53/-9.82	-9.81/-10.25	-10.69/-11.47	-11.99/-12.6	-14.05/-15.26	-15.95/-16.79	-17.59/-19.74	-19.14/-18.53	-18.05/-17.57	-18.54/-16.95	-15.87/-15.2	-15.28/-15.7	-15.21/-14.62	-14.71/-14.24	-13.59/-13.39	-14.09/-14.68	-14.67/-14.79	-15.86/-17.12	-18.08/-18.48	-17.64/-19.1
Φ(7.5°)	-18.51/-17.7	-19.02/-18.82	-17.88/-17.7	-17.35/-15.05	-13.76/-13.41	-13.27/-13.35	-14.14/-14.25	-14.14/-16.29	-16.34/-14.83	-15.35/-17.01	-17.71/-18.36	-19.04/-18.99	-15.93/-13.67	-11.81/-16.07	-9.86/-9.57	-9.74/-10.23	-10.35/-10.89	-12.04/-13.29	-13.83/-15.46	-18.34/-18.48	-18.55/-18.24	-17.99/-18.92	-17.99/-18.92	-17.99/-18.92
Φ(15°)	-18.16/-19.3	-18.03/-16.51	-14.62/-13.16	-12.33/-12.08	-13.13/-14.09	-13.68/-13.4	-13.83/-14.46	-12.95/-14.02	-13.81/-13.01	-15.35/-15.61	-18.51/-19.98	-17.37/-19.2	-14.81/-11.23	-9.23/-9.53	-9.79/-9.89	-9.83/-9.88	-11.01/-11.57	-12.63/-13.91	-14.09/-15.28	-18.73/-18.37	-19.01/-19.13	-19.01/-19.13	-19.01/-19.13	-19.01/-19.13
Φ(22.5°)	-16.23/-15.45	-14.25/-11.98	-10.69/-10.52	-10.45/-10.51	-10.21/-9.54	-9.91/-10.54	-11.36/-11.9	-10.85/-9.37	-8.78/-9.44	-9.43/-8.5	-8.89/-10.33	-13.02/-17.09	-18.84/-18.47	-14.91/-12.08	-10.55/-9.82	-9.58/-9.92	-10.16/-10.58	-11.05/-11.79	-12.85/-13.29	-12.35/-11.22	-10.91/-11.36	-12.51/-12.75	-11.71/-10.85	-11.29/-13.59
Φ(30°)	-11.56/-11.56	-10.76/-9.71	-8.69/8.01	-7.71/-6.66	-10.07/-12.47	-13.19/-12.69	-11.89/-11.01	-9.51/-7.7	-6.58/-6.41	-6.46/-6.68	-7.71/-8.57	-9.46/-11.67	-17.05/-18.92	-19.03/-15.89	-12.98/-13.13	-11.82/-11.82	-11.31/-8.7	-6.96/-7.49	-9.07/-9.57	-9.19/-8.57	-9.72/-10.89	-11.42/-12	-12.37/-11.16	-10.31/-10.51
Φ(37.5°)	-17.41/-18.72	-12.99/-10.88	-9.08/-8.89	-11.11/-14.25	-13.91/-12.47	-11.73/-10.71	-10.44/-10.28	-9.68/-8.12	-7.71/-6.98	-7.22/-7.17	-7.34/-8.28	-9.78/-11.56	-13.88/-16.96	-18.52/-17.07	-17.53/-19.09	-18.12/-14.08	-10.35/-8.79	-7.73/-5.65	-5.06/-6.4	-7.47/-7.15	-7.59/-8.66	-10.91/-10.63	-11.50/-10.5	-9.67/-11.8
Φ(45°)	-8.61/-12.79	-15.91/-12.79	-8.91/9.56	-12.18/-14.71	-15.79/-16.19	-15.08/-11.92	-9.99/-9.61	-9.37/-8.93	-8.19/-8.32	-10.21/-11.94	-9.96/-8.27	-8.09/-8.19	-9.31/-10.06	-12.01/-18.04	-18.26/-15.86	-14.47/-10.84	-11.61/-9.2	-7.84/-6.9	-6.61/-6.94	-6.44/-6.75	-8.58/-12.03	-12.04/-11.17	-8.25/-7.7	-8.25/-7.7
Φ(52.5°)	-5.83/-9.93	-11.81/9.58	-7.95/-9.8	-8.57/-9.45	-11.07/-13.27	-17.31/-17.77	-12.46/-11.88	-11.67/-10.66	-8.64/-8.2	-11.51/-15.24	-15.25/-11.82	-10.91/8	-9.15/-8.92	-11.42/-13.66	-12.21/-12.02	-15.98/-14.88	-12.37/-18.25	-6.35/-6.47	-7.81/-9.48	-10.21/-10.68	-9.76/-11.74	-18.38/-17.68	-12.36/-6.3	-12.36/-6.3
Φ(60°)	-4.51/-6.85	-8.28/-8.15	-6.66/-6.26	-6.21/-6.68	-9.81/-14.21	-15.41/-12.98	-12.02/-12.55	-13.94/-15.88	-16.18/-11.29	-10.14/-11.58	-12.94/-14.58	-13.15/-8.82	-7.58/-6.57	-9.55/-11.34	-12.54/-9.17	-8.04/-12.08	-13.36/-13.64	-14.81/-15.17	-9.51/-7.44	-8.19/-10.6	-10.65/-14.33	-16.69/-14.46	-10.67/-12.58	-15.25/-9.41
Φ(67.5°)	-3.34/-4.19	-5.81/-6.47	-4.55/-4.12	-6.31/-7.39	-8.43/-7.86	-7.17/-7.82	-10.02/-14.37	-18.54/-15.98	-14.71/-10.9	-8.11/-10.02	-9.23/-9.19	-10.66/-9.91	-9.21/-7.83	-8.81/8.45	-6.84/-6.02	-9.73/-15.13	-10.07/-9.29	-13.77/-17.23	-18.27/-17.51	-12.33/-10.03	-10.64/-9.6	-11.57/-11.15	-9.68/-8.32	-6.69/-6.5
Φ(75°)	-1.78/-0.95	-2.64/-3.13	-2.71/-2.73	-4.23/-4.54	-5.09/-5.32	-5.38/-6.05	-7.48/-9.75	-11.45/-12.14	-9.89/-8.3	-6.09/-7.01	-5.64/-5.8	-6.74/-6.92	-6.43/-5.46	-5.79/7	-4.64/-5.02	-8.37/-10.22	-11.76/-10.74	-12.21/-13.94	-14.16/-16.16	-12.42/-11.2	-12.38/-12.78	-9.53/-7.21	-6.12/-8.43	-5.38/-5.56
Φ(82.5°)	-1.88/-1.73	-2.25/-0.9	-0.13/-1.65	-4.65/-3.52	-2.32/-1.8	-2.91/3.7	-5.86/-6.49	-7.11/-9.7	-6.38/-5.66	-4.48/-3.56	-2.69/-3.67	-5.73/-4.65	-2.66/-2.54	-2.51/4.51	-5.32/-4.62	-5.73/-5.98	-6.66/-8.79	-11.17/-12.83	-17.81/-14.5	-15.54/-17.42	-9.31/-7.15	-6.36/-4.76	-5.28/-5.24	-3.37/-3.51
Φ(90°)	-4.44/-4.7	-2.62/-0.24	-0.88/-2.62	-1.340/7.1	2.160/6.9	-1.91/3.03	-5.89/-7.51	-10.02/-12.79	-12.33/-8.46	-5.99/-3.08	-1.81/-1.53	-1.56/-1.49	-1.69/-1.93	-4.24/-2.49	-5.72/-4.8	-6.77/-7.89	-12.52/-8.48	-10.04/-8.76	-12.58/-9.52	-17.45/-18.73	-10.19/-8.52	-7.98/-8.16	-7.81/-6.19	-3.16/-3.91
Φ(97.5°)	-5.32/4.29	-5.95/4.85	-3.46/-4.27	-2.21/-2.03	-0.99/-2.3	-3.36/3.97	-4.93/-6.43	-8.58/-9.06	-9.25/-9.27	-7.26/-3.72	-1.51/-1.07	-0.83/-0.73	-0.93/-1.22	-2.71/-2.6	-2.53/-2.75	-4.96/-6.7	-10.65/-14.61	-18.05/-12.23	-18.11/-13.68	-15.37/-13.17	-15.28/-10.78	-4.56/-8.42	-6.75/-8.61	-8.45/-11.7
Φ(105°)	-4.44/5.76	-9.12/9	-4.14/-2.33	-1.64/-2.17	-3.01/-3.53	-2.67/-2.9	-3.66/-5.72	-9.11/5.9	-10.82/-8.81	-6.73/-4.91	-2.08/6	-1.31/-1.25	-0.130/0.6	-0.65/-0.84	-4.03/-3.23	-10.91/-9.37	-13.22/-13.73	-18.88/-14.92	-16.12/-9.94	-14.61/-10.64	-12.06/-13.34	-11.45/-10.87	-11.45/-10.87	-13.46/-7.69
Φ(112.5°)	-8.23/-7.7	-9.96/5.57	-3.91/3.9	-4.47/-5.53	-4.25/-2.82	-2.85/-1.2	-4.89/-4.4	-6.43/-7.43	-7.85/-8.1	-4.89/4.49	-2.87/-1.65	-1.23/-0.59	-1.03/-1.62	-5.06/-4.91	-7.19/-11.67	-10.59/-10.71	-14.21/-15.26	-18.36/-9.35	-11.01/-17.06	-17.84/-9.7	-8.91/11	-18.43/-16.74	-11.46/-9.1	
Φ(120°)	-10.57/6.94	-7.83/6.5	-3.46/-2.78	-3.46/-4.4	-5.66/-4.03	-2.98/2.5	-2.69/-3.5	-5.39/7	-6.77/-6.82	-7.71/-6.24	-3.42/-1.89	-1.01/-1.45	-1.24/-2.36	-3.11/-2.71	-4.36/-8.32	-8.79/-17.1	-19.11/11	-17.51/-18.59	-17.31/-19.22	-9.43/-33.2	-17.26/-19.5	-15.04/-14.95	-12.09/-10.46	-11.59/-14.7
Φ(127.5°)	-10.22/5.03	-4.45/-4.39	-5.65/-7.18	-5.87/-4.85	-4.93/-4.6	-2.47/-2.35	-3.34/-4.78	-5.69/-5.79	-5.91/-6.44	-7.49/-6.2	-3.81/-1.93	-1.22/-1.97	-3.59/-1.5	-5.54/-5.03	-6.64/-8.16	-10.49/-14.24	-19.31/-12.73	-18.29/-18.46	-15.15/-12.46	-15.28/-14.02	-8.96/-6.78	-6.46/-7.77	-14.99/-19.2	
Φ(135°)	-7.82/5.19	-5.22/6.04	-7.61/8.07	-7.24/5.78	-4.92/4.46	-4.64/4.95	-5.71/5.58	-5.79/5.8	-6.04/-6.73	-7.71/-5.27	-4.55/-4.96	-4.73/-5.12	-6.09/-6.2	-5.61/-6.95	-7.42/-7.31	-6.34/-4.72	-9.42/-10.15	-11.41/-12.92	-10.19/-8.87	-12.42/-12.59	-7.83/-9.05	-10.59/-12.67	-10.61/-12.68	
Φ(142.5°)	-5.72/3.88	-3.92/5.35	-8.78/13.42	-17.33/10.25	-5.65/4.13	-4.28/5.11	-6.49/8.37	-9.44/9.55	-8.86/7.75	-7.26/6.4	-5.38/4.6	-5.07/5.89	-7.19/7.38	-5.38/4.16	-3.43/5	-6.41/7.27	-16.36/13.87	-14.85/12.12	-12.77/11.13	-11.06/18.77	-10.01/8.2	-8.11/9.04	-14.99/18.39	-13.67/9.89
Φ(150°)	-7.82/3.7	-10.26/-12.32	-11.17/8.71	-8.79/-10.7	-13.07/-13.07	-11.04/-10.42	-9.32/8.43	-7.61/7.09	-7.13/-6.55	-5.77/5.82	-6.18/-6.92	-7.54/8.86	-6.61/5.86	-5.33/4.54	-6.37/9.34	-14.84/19.3	-12.99/6.33	-12.07/18.3	-18.71/-11.96	-15.15/-12.46	-15.28/-14.02	-9.67/-6.48	-9.18/7.19	-7.06/7.82
Φ(157.5°)	-6.55/7.37	-9.15/12	-17.64/-19.01	-18.21/17.1	-16.09/13.47	-11.05/-10.32	-10.68/-11.82	-12.71/-11.29	-8.65/-7.41	-8.26/-10.06	-10.63/-9.69	-12.92/-10.42	-11.96/-12.75	-13.97/17.64	-16.61/14.04	-15.63/18.36	-17.34/-18.6	-18.42/-18.48	-17.95/-16.96	-14.74/-15.31	-10.29/18.15	-7.24/-6.84	-10.29/18.15	-7.24/-6.84
Φ(165°)	-13.43/-15.46	-18.35/-18.06	-15.87/14.45	-14.48/-15.37	-17.45/-18.78	-17.56/-16.41	-14.62/-14.86	-15.21/-14.46	-14.71/-17.28	-17.53/-17.55	-14.41/-12.92	-12.11/-11.85	-12.14/-13.2	-13.65/-14.97	-16.55/-15.2	-14.42/-14.85	-16.72/-18.57	-19.27/19.23	-18.79/17.37	-14.46/-11.58	-9.32/8.08	-7.81/7.35	-7.12/7.52	-9.16/-11.69
Φ(172.5°)	-13.65/-16.63	-17.29/-17.68	-17.98/18.28	-18.61/-17.76	-17.78/-18.28	-16.72/-15.87	-15.84/-14.66	-12.38/-11.29	-10.93/-10.89	-8.72/-9.65	-11.46/-13.82	-16.41/-17.99	-18.56/18.72	-19.48/17.77	-16.35/-15.63	-15.76/-16.97	-17.28/-16.55	-15.81/-15.11	-13.97/12.28	-10.78/10.43	-10.19/4.7	-8.97/9.3	-10.31/11.82	-10.31/11.82
Φ(180°)	-14.26/-14.91	-15.61/-16.08	-17.99/18.56	-18.91/18.19	-18.98/17.61	-17.88/-18.55	-17.81/14.26	-12.35/-11.65	-11.77/11.74	-11.28/10.89	-11.47/13.44	-16.16/-17.35	-15.86/14.47	-13.73/13.94	-15.38/17.54	-18.43/18.97	-17.59/19.14	-18.88/18.57	-17.18/16.71	-14.79/15.26	-18.11/16.49	-15.53/14.75	-14.28/13.91	-13.35/13.34
Phi (Hz)	5.63Pol	ThetaAnt. 1																						
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°)
Φ(0°)	-10.41/-10.06	-11.01/-10.15	-11.37/-13.54	-13.58/14.46	-13.89/11.96	-11.79/10.46	-9.88/9.46	-9.51/9.01	-8.56/8.77	-9.62/10.55	-10.54/10.15	-9.64/10.77	-10.19/10.256	-10.75/11.21	-11.11/10.47	-12.03/13.77	-15.49/11.64	-11.11/10.47	-12.03/13.77	-15.49/11.64	-11.11/10.47	-12.03/13.77	-15.49/11.64	-11.11/10.47
Φ(7.5°)	-11.32/-12.4	-11.98/-11.88	-12.87/-12.67	-12.76/-12.77	-11.85/-12.04	-14.81/-15.83	-13.69/13.68	-15.47/15.12	-12.75/12.08	-12.78/-12.19	-10.71/9.94	-9.54/9.33	-9.27/9.27	-9.36/9.72	-10.41/10.92									



Radiated Composite Gain of 2.4GHz and 5GHz UNII 1~3

Appendix A

Freq(Hz)	ThetaAnt. 1	ThetaAnt. 2	ThetaAnt. 3	ThetaAnt. 4	ThetaAnt. 5	ThetaAnt. 6	ThetaAnt. 7	ThetaAnt. 8	ThetaAnt. 9	ThetaAnt. 10	ThetaAnt. 11	ThetaAnt. 12	ThetaAnt. 13	ThetaAnt. 14	ThetaAnt. 15	ThetaAnt. 16	ThetaAnt. 17	ThetaAnt. 18	ThetaAnt. 19	ThetaAnt. 20	ThetaAnt. 21	ThetaAnt. 22	ThetaAnt. 23	ThetaAnt. 24	ThetaAnt. 25													
Theta(75°)	-11.28/-16.56	-18.89/-17.61	-16.91/-18.58	-18.31/-14.03	-13.06/-12.56	-14.67/-18.09	-18.63/-17.45	-18.96/-18.72	-18.17/-18.17	-18.52/-12.75	-11.24/-17.45	-18.91/-19.27	-18.66/-11.44	-8.57/-13.26	-19.34/-14.62	-13.22/-10.73	-9.95/-9.16	-12.91/-11.51	-9.28/-10.31	-16.13/-18.36	-16.58/-14.63	-7.91/-12.11	-17.93/-10.34	-10.05/-10.81														
Theta(82.5°)	-10.02/-11.58	-18.35/-14.46	-13.11/-18.47	-13.87/-8.88	-9.38/-10.99	-16.57/-16.01	-15.51/-14.03	-12.94/-11.32	-12.33/-14.8	-18.72/-10.7	-13.35/-16.46	-12.96/-16.1	-17.47/-16.46	-13.31/-15.85	-14.52/-14.82	-13.74/-12.5	-10.93/-8.4	-8.71/-17.1	-18.11/-18.4	-13.77/-15.71	-18.55/-10.27	-9.68/-10.78	-8.71/-8.32	-10.45/-13.35														
Theta(90°)	-8.24/-12.79	-18.11/-13.26	-16.51/-18.12	-13.81/-13.86	-10.31/-14.4	-15.24/-15.55	-14.39/-12.42	-12.11/-11.38	-12.63/-14.25	-16.33/-15.19	-14.03/-10.57	-15.39/-18.73	-18.03/-18.71	-18.93/-16.64	-16.64/-13.31	-15.62/-14.57	-14.27/-12.88	-14.67/-13.53	-17.97/-16.48	-19.18/-32	-15.93/-18.66	-11.82/-9.21	-9.39/-8.07	-9.71/-9.92														
Theta(97.5°)	-8.51/-12.2	-13.27/9.29	-12.73/17.84	-11.47/-10.61	-13.02/-17.78	-18.19/-19.02	-15.24/13.17	-16.66/-12.42	-12.81/-14.3	-18.31/11.94	-18.33/19.48	-13.41/-12	-12.56/-15.45	-18.85/-19.16	-18.27/-18.03	-19.04/13.06	-13.72/15.65	-17.81/14.28	-18.65/-16.55	-15.09/16.11	-18.56/-17.2	-10.47/8.21	-5.69/6.46	-10.25/8.63														
Theta(105°)	-11.54/9.37	-8.03/-10.41	-12.37/9.31	-8.86/-8.7	-9.68/-11.25	-13.25/-14.68	-14.53/-13.51	-16.48/-18.36	-15.41/-11.22	-14.79/13.54	-13.52/-17.9	-18.72/-13.49	-11.23/-12.3	-15.17/-16.7	-16.78/-17.77	-17.57/14.99	-13.05/-11.56	-12.81/14.7	-14.28/-18.68	-18.69/-13.51	-11.18/-4.35	-3.72/7.44	-9.43/-10.71															
Theta(112.5°)	-13.48/8.53	-10.78/-13.24	-12.14/7.26	-6.27/-6.38	-7.94/-12.03	-16.53/-17.65	-18.32/-18.73	-18.75/-18.36	-17.36/-10.45	-8.41/-10.03	-17.71/17.4	-15.53/14.33	-9.49/9.32	-14.97/-18.21	-18.64/13.31	-18.99/9.85	-8.38/-10.4	-13.92/-15.06	-18.03/-18.45	-17.32/17.5	-18.77/8.02	-11.84/10.2	-8.46/-10.8	-8.66/14.47														
Theta(120°)	-8.85/-10.63	-15.51/10.82	-6.87/6.66	-5.76/5.7	-8.01/8.8	-9.21/9.23	-10.96/-13.53	-17.49/-18.87	-16.64/9.39	-7.71/10.58	-9.48/7.98	-9.37/15.98	-19.18/-17.56	-14.31/13.11	-18.11/18.71	-16.02/16.81	-10.61/8.52	-13.06/18.16	-12.45/13.41	-16.53/13.62	-14.38/7.43	-7.57/6.91	-10.16/14.45	-18.91/14.47														
Theta(127.5°)	-10.41/-10.05	-10.21/9.45	-7.76/9.08	-12.23/12.09	-8.91/5.77	-5.21/6.49	-8.17/10.09	-10.83/12.16	-18.11/13.24	-11.66/12.75	-13.61/16.96	-18.59/-18.91	-18.55/-18.64	-18.71/18.51	-18.61/-18.68	-12.97/18.5	-18.81/13.3	-14.13/14.72	-18.54/16.51	-14.42/8.04	-14.63/10.82	-7.61/9.27	-14.48/8.84	-17.36/15.31														
Theta(135°)	-11.01/8.28	-7.32/8.16	-9.07/11.54	-18.29/15	-9.01/6.34	-4.51/4.42	-6.37/8.13	-7.68/9.86	-16.17/15.28	-16.14/15.37	-14.12/14.9	-15.74/17.59	-19.11/18.59	-18.08/14.02	-12.16/13.77	-16.07/17.87	-14.91/14.16	-18.72/18.58	-17.35/17.58	-18.06/18.72	-17.81/15.56	-16.43/13	-13.41/15.76	-18.79/17.39														
Theta(142.5°)	-6.65/4.83	-5.81/8.41	-12.88/18.44	-17.61/11.74	-8.58/6.72	-6.06/5.68	-5.68/5.29	-5.48/6.71	-9.26/10.45	-9.74/10.21	-10.53/12.85	-17.43/18.25	-18.26/15.49	-11.42/11.05	-16.73/17.86	-18.73/18.76	-15.88/10.38	-17.38/19.13	-18.71/19.18	-14.79/8.52	-7.23/7.59	-10.75/19.09	-17.83/18.45	-15.91/9.19														
Theta(150°)	-5.51/7.8	-13.18/18.12	-16.29/17.68	-14.94/13.95	-14.72/15.57	-14.93/13.6	-13.51/11.92	-9.05/8.04	-7.89/6.54	-6.14/8.14	-10.62/12	-13.33/16.15	-18.25/17.45	-18.29/17.7	-15.46/12.29	-16.27/17.34	-19.2/17.05	-17.81/11.33	-8.94/9.23	-15.52/16.59	-11.53/7.88	-14.46/14.47	-6.37/5.14															
Theta(157.5°)	-6.71/10.58	-16.99/14.41	-10.73/9.99	-11.42/13.05	-13.55/14.58	-17.29/18.2	-17.85/19.99	-16.81/11.2	-8.29/7.9	-7.19/5.44	-3.98/4.05	-4.58/6.01	-8.27/11.77	-17.22/18.61	-19.78/17.83	-18.96/18.89	-19.33/14.65	-15.27/17.58	-17.91/17.14	-18.34/18.05	-10.52/12.05	-6.82/6.83	-5.56/5.24															
Theta(165°)	-9.62/10.43	-9.27/7.61	-6.42/6.38	-6.94/8.01	-9.69/11.65	-13.78/15.22	-14.69/13.92	-12.73/10.3	-9.16/9.99	-9.71/8	-6.83/6.97	-8.35/11.17	-15.43/17.89	-17.89/17.86	-17.13/17	-18.61/18.81	-18.98/15.09	-15.21/17.83	-17.58/18.4	-17.94/18.28	-19.33/15.88	-12.41/11.52	-11.78/10.11	-8.72/9.04														
Theta(172.5°)	-19.78/15.13	-12.59/11.39	-10.24/9.32	-9.14/15.58	-10.13/11.81	-15.61/17.9	-19.14/18.7	-19.26/17.02	-15.95/12.74	-10.58/10.08	-9.41/8.85	-9.01/7.8	-10.87/12.22	-13.98/16.08	-18.18/17.94	-18.23/19.14	-18.19/18.37	-18.45/17.4	-18.15/19	-17.74/18.67	-19.36/18.25	-19.46/18.95	-18.27/18.83	-18.39/18.5														
Theta(180°)	-17.81/17.38	-18.93/18.17	-18.43/17.52	-18.64/19.42	-16.29/15.17	-15.44/16.21	-17.68/18.18	-16.35/15.71	-15.44/14.54	-13.81/12.53	-9.12/8.68	-15.06/18.59	-17.88/18.64	-17.76/18.49	-17.11/15.92	-14.92/14.32	-14.52/15.56	-16.58/17.06	-16.84/18.24	-18.41/17.87	-18.79/18.25	-17.55/18.76	-18.97/13.7	-17.06/17.94														
Freq(Hz)	5.785GPol.	ThetaAnt. 1	ThetaAnt. 2	ThetaAnt. 3	ThetaAnt. 4	ThetaAnt. 5	ThetaAnt. 6	ThetaAnt. 7	ThetaAnt. 8	ThetaAnt. 9	ThetaAnt. 10	ThetaAnt. 11	ThetaAnt. 12	ThetaAnt. 13	ThetaAnt. 14	ThetaAnt. 15	ThetaAnt. 16	ThetaAnt. 17	ThetaAnt. 18	ThetaAnt. 19	ThetaAnt. 20	ThetaAnt. 21	ThetaAnt. 22	ThetaAnt. 23	ThetaAnt. 24	ThetaAnt. 25												
Gain	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(75°)	-10.05/9.51	-9.01/8.46	-7.91/8.05	-8.38/8.28	-8.15/8.18	-8.74/9.57	-8.74/9.57	-10.34/10.41	-10.88/11.64	-12.33/11.49	-10.83/10.71	-11.29/10.22	-9.09/8.47	-7.98/7.8	-7.77/7.77	-7.55/7.6	-7.45/7.68	-8.12/8.88	-9.76/10.57	-10.84/11.75	-13.36/15.59	-15.63/14.4	-13.31/12.33	-12.71/10.5														
Theta(82.5°)	-8.58/8.41	-7.81/8.05	-8.05/8.8	-9.23/9.23	-8.76/8.33	-8.61/9.12	-9.99/11.26	-12.22/12.32	-13.47/15.48	-16.46/15.8	-15.28/13.77	-12.42/11.12	-10.19/9.7	-9.42/8.99	-8.84/8.49	-8.54/8.75	-9.45/9.65	-9.71/9.83	-10.56/11.38	-11.78/11.76	-11.36/11.15	-10.78/10.23	-9.71/9.41	-9.69/9.09														
Theta(90°)	-10.71/10.22	-10.46/10.57	-10.24/10.31	-9.78/9.38	-9.57/10.05	-9.81/10.17	-11.39/13.23	-11.88/11.14	-11.97/14.14	-18.07/18.85	-18.18/8.88	-18.04/18.48	-16.77/14.77	-12.94/11.36	-9.85/8.27	-7.54/6.94	-6.44/5.5	-5.49/5.52	-6.47/5.75	-8.27/8.49	-9.03/8.89	-10.52/10.87	-11.04/11.01	-10.53/10.97														
Theta(97.5°)	-12.93/14.51	-12.99/10.39	-8.67/8.81	-8.38/10.48	-12.72/13.07	-11.91/9.94	-8.57/8.28	-8.07/7.4	-7.13/6.83	-11.39/11.22	-11.42/11.32	-10.95/9.76	-10.21/11.55	-13.15/13.71	-18.29/11.38	-9.87/8.3	-6.71/5.62	-5.31/5.68	-6.1/6.42	-6.91/7.61	-8.9/9.79	-11.08/12.94	-15.16/12.1															
Theta(105°)	-16.81/11.22	-8.24/6.65	-6.12/7.54	-9.96/9.81	-9.35/9.25	-8.01/7.04	-7.02/7.19	-6.98/6.48	-7.1/9.33	-10.96/10.9	-11.07/11.45	-11.27/9.26	-6.71/5.42	-5.71/3.36	-9.75/12.36	-16.78/18.89	-18.31/13.8	-10.76/9.47	-7.37/5.69	-4.4/4.14	-4.21/4.07	-4.59/5.14	-5.62/6.85	-9.27/13.86														
Theta(112.5°)	-7.74/7.99	-7.32/9.51	-6.94/8.85	-8.18/11.78	-6.47/6.28	-6.13/5.95	-6.91/8.76	-6.13/5.44	-18.43/17.7	-16.29/14.85	-13.04/11.86	-10.35/9.36	-6.97/5.89	-5.88/6.74	-8.95/12.35	-18.83/18.11	-19.3/17	-9.78/7.73	-6.79/7.48	-3.51/3.52	-4.48/4.64	-3.95/4.86	-5.41/7.48	-5.06/6.47														
Theta(120°)	-6.55/7.49	-8.04/8.21	-9.78/8.91	-6.51/9.49	-5.53/5.5	-7.25/8.36	-9.24/10.49	-12.16/13.69	-14.33/13.91	-14.36/15.04	-11.26/8.77	-8.93/12.82	-10.04/5.95	-4.64/4.06	-4.69/6.85	-8.66/10.32	-12.75/13.34	-9.68/7.79	-4.31/3.78	-2.71/3.45	-6.47/6.66	-6.11/5.92	-6.25/7.3															
Theta(127.5°)	-4.44/5.47	-6.44/10.37	-10.74/9.26	-8.64/8.79	-8.15/7.38	-7.85/8.37	-10.05/13.04	-12.93/10.19	-8.82/8.39	-8.18/9.07	-10.09/8.99	-7.95/8.61	-9.82/6.81	-6.3/6.97	-7.02/8.01	-11.11/11.62	-16.73/19.29	-13.13/10.51	-9.07/6.22	-5.02/5.78	-6.51/5.84	-7.26/11.01	-10.12/5.96	-4.02/4.61														
Theta(135°)	-2.97/3.42	-4.11/6.43	-5.03/6.41	-5.18/6.34	-6.62/8.05	-11.58/8.62	-8.32/7.27	-7.67/8.18	-7.02/8.18	-8.91/8.6	-7.99/8.32	-12.73/9.08	-6.29/5.38	-4.98/5.34	-6.76/13.52	-13.33/19.24	-10.97/7.61	-5.86/4.85	-6.47/7.77	-9.82/10.78	-7.89/8.5	-14.05/9.43	-2.58/1.85															
Theta(142.5°)	-1.36/2.53	-3.3/3.24	-1.61/0.94	-2.68/2.94	-3.01/4.71	-8.47/17.84	-18.65/11.21	-9.85/11.37	-9.59/11.32	-8.36/7.64	-10.54/10.77	-7.31/8.84	-10.44/10.56	-5.15/4.78	-3.61/2.57	-4.56/7.19	-11.41/12.22	-13.59/10.49	-10.71/6.2	-12.27/9.94	-12.27/9.94	-11.21/10.33	-3.84/0.53															
Theta(150°)	0/-1.79	-2.83/0.56	-0.4/0.76	-1.11/1.96	-1.97/3.44	-7.64/12.73	-11.46/10.94	-11.78/11.41	-11.37/12.38	-13.69/10.98	-11.51/10.12	-5.57/4.2	-6.02/5.51	-5.01/5.59	-2.02/1.07	-1.9/2.96	-5.95/9.21	-15.84/12.87	-12.82/10.38	-11.63/12.37	-17.68/13.51	-9.11/9.29	-9.15/3.56	-1.590/18														
Theta(157.5°)	0.13/0.74	-1.30/0.1	0.04/1.36	-0.98/0.72	-1.48/2.81	-4.02/2.64	-8.21/12.47	-18.34/15.05	-10.29/14	-13.38/8.21	-6.91/5.25	-3.6/3.8	-3.32/1.63	-2.14/4.49	-3.11/1.41	-11.83	-7.91/6.7	-4.62/7.18	-6.36/7.6	-11.84/12.51	-7.25/6.69	-5.61/4	-5.24/3.38	-0.70/6.7														
Theta(165°)	-3.06/1.8																																					



Radiated Composite Gain of 2.4GHz and 5GHz UNII 1~3

Appendix A

Theta	14.58/8.5	9.85/15.04	15.39/9.91	13.4/18.88	15.61/9.14	7.69/8.07	9.71/12.35	11.85/8.31	8.55/12.54	17.9/15.95	10.78/9.18	13.91/17.62	15.7/15.96	9.75/8.41	12.02/10.35	7.71/9.8	10.48/18.52	14.21/16.76	18.19/9.95	8.22/11.47	11.66/6.55	14.14/17.86	18.14/17.95	17.94/18.1
Theta	17.63/13.5	12.18/11.01	19.27/12.69	13.64/18.06	15.21/10.29	9.04/9.97	9.59/9.56	12.64/15.91	15.62/13.45	11.66/11.74	10.11/9.69	12.36/14.78	14.79/16.03	13.45/9.33	6.65/9.83	13.65/14.42	12.28/17.52	14.89/12.62	18.8/16.09	13.47/8.07	9.88/6.15	7.16/13.61	18.53/19.14	13.55/11.75
Theta	11.17/19.12	17.88/12.04	11.52/12.69	17.52/13.64	11.99/11.79	10.78/10.13	10.78/10.13	14.03/13.96	11.91/9.67	10.97/15.91	15.04/12.63	12.63/14.13	14.97/11.36	9.06/6.7	7.47/16.68	18.49/17.9	16.41/19.85	18.63/18.28	18.24/17.1	12.51/12.42	17.16/14.59	8.38/7.54	11.26/17.16	12.12/8.27
Theta	6.19/9.11	15.18/17.59	14.82/16.39	17.52/19.43	18.45/14.08	9.71/9.27	10.57/14.54	17.36/18.21	17.05/18.56	17.97/19.26	17.75/12.4	9.94/12.16	17.47/17.82	17.18/18.11	18.19/18.2	15.99/13.01	10.9/10.38	12.99/19.12	18.58/12.94	7.69/6.66	7.62/7.25	6.04/5.93	9.13/11.97	7.89/5.18
Theta	12.68/11.16	11.12/11.4	12.47/12.26	12.05/13.41	13.51/13.82	11.36/12.25	14.11/15.36	15.93/15.7	15.5/16.44	17.65/17.7	18.65/17.44	16.51/16.51	13.06/11.46	12.58/15.13	17.77/18.33	17.29/13.36	9.11/8.68	11.06/16.08	15.15/9.94	7/5.98	5.42/4.52	4.48/4.61	6.78/10.89	18.33/14.46
Theta	11.9/9.59	9.61/10.58	12.05/12.37	13.18/15.02	15.97/16.52	15.43/15.16	15.01/14.94	16.12/16.46	17.18/55	18.57/17.23	17.12/85	16.97/13.49	11.04/9.35	8.21/7.56	7.27/17.19	17.83/7.94	7.86/8.88	10.68/13.19	13.07/10.03	7.4/6.2	5.71/5.27	5.66/5.55	9.34/15.18	18.52/15.01
Theta	14.8/13.61	14.42/17.51	18.95/18.25	18.31/18.64	18.2/17.91	18.29/19.46	16.98/16.62	18.4/17	14.8/14.61	15.59/15.94	15.44/13.72	11.66/9.67	8.56/8.06	7.58/7.65	7.99/8.85	10.95/12.73	13.7/14.29	14.8/16.14	14.36/11.83	9.71/9.39	10.54/11.35	13.49/16.19	19.3/19.02	18.2/16.87
Theta	12.23/12.19	13.45/16.78	19.04/17.13	17.51/18.89	17.73/19.29	17.85/18.17	17.81/18.18	17.98/18.42	15.19/14.27	14.1/13.89	13.91/13.58	13.59/14.05	14.15/14.71	15.77/17.78	17.83/18	18.84/19.17	18.76/17.44	19.23/18.16	18.49/19.56	18.08/18.79	18.44/16.58	15.71/14.83	14.26/13.64	13.76/12.68
Theta	5.2/Pol.	Theta/Ant. 2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
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)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	11.37/11.33	13.26/15.91	17.83/15.27	13.58/14.05	13.52/13.62	15.09/13.14	11.46/10.18	9.46/9.68	9.39/9.3	8.66/8.37	8.43/8.71	9.03/10.39	11.35/11.95	12.34/11.88	12.52/13.79	15.86/17.37	16.64/15.52	16.1/18.67	17.28/15.6	13.92/13.02	13.31/13.17	12.49/12.11	12.51/12.53	11.24/10.97
Theta	9.52/9.58	10.21/11.81	13.92/13.81	14.12/16.64	17.19/18.29	18.82/19.19	15.68/15.22	14.44/18.77	13.81/13.31	12.14/11.92	12.11/12.27	13.68/14.88	15.29/15.86	14.93/13.45	13.96/15.28	15.91/15.14	13.75/12.34	12.43/11.48	10.03/9.82	8.78/8.91	8.08/7.87	8.4/8.96	9.14/9.7	9.14/9.7
Theta	13.59/13.2	13.08/13.7	15.5/17.69	18.47/17.68	18.87/18.34	14.16/13.23	10.97/10.85	11.14/11.43	11.24/11.65	13.39/15.03	17.63/19.01	16.83/14.92	12.95/11.54	10.82/11.2	10.96/11.85	12.6/12.89	13.8/15.73	19.33/18.05	18.92/15.25	13.07/11	9.24/8.69	8.46/8.89	10.32/12.51	10.32/12.51
Theta	16.51/18	18.37/17.53	19.05/18.83	18.49/19.02	15.17/13.12	10.37/10.25	10.42/11.08	11.93/11.66	11.11/9.4	8.52/9.14	11.25/12.7	13.81/13.09	12.88/11.79	11.28/9.11	8.27/7.19	6.2/5.71	5.51/5.94	6.36/6.81	6.95/7.81	8.33/9.64	10.68/13.36	15.55/14.28	11.62/9.56	10.14/12.21
Theta	11.2/17.2	18.45/19.03	18.59/16.7	17.81/17.96	17.8/18.91	17.53/19.67	18.62/15.71	11.47/8.89	7.46/6.5	6.3/6.9	8.33/10.26	12.06/13.98	15.2/13.9	11.19/9.46	8.11/7.12	5.16/4.36	4.47/5.9	6.5/5.72	4.86/4.53	4.98/4.74	4.28/4.52	10.87/10.02	11.49/10.94	8.79/8.89
Theta	8.74/10.88	14.87/10.63	13.16/11.12	12.61/17.16	18.5/15.02	12.7/10.18	8.37/13.2	7.23/6.93	6.8/6.96	7.95/8.74	9.75/10.47	11.72/12.5	12.99/12.01	10.52/9.24	9.31/8.66	7.53/7.1	8.17/5.55	6.15/6.42	8.77/12.48	14.29/10.72	8.68/8.24	8.45/9.34	11.89/19.04	13.41/9.1
Theta	7.58/11.31	14.41/19.31	12.53/12.03	12.25/13	11.14/8.52	8.79/8.03	6.48/5.55	5.83/6.41	6.94/6.53	6.61/7.14	8.51/9.98	10.06/8.43	8.12/8.03	8.09/9.51	12.17/11.37	9.99/10.42	10.92/8.69	8/7.78	6.81/7.54	11.34/16.36	15.05/10.68	8.64/8.69	9.74/11.43	8.69/5.64
Theta	6.9/16.89	11.97/12.1	9.49/12.02	11.55/8.71	8/6.47	7.29/6.76	6.79/4.86	3.79/3.02	3.15/2.56	3.66/6.04	7.91/9.1	8.41/7.28	6.65/7.21	7.35/8.29	11.35/9.81	6.3/5.89	6.19/7.19	8.74/8.33	7.95/8.71	8.65/8.21	9.99/12.62	10.5/8.39	8.36/9.68	9.56/5.12
Theta	5.45/12.77	14.37/17.2	9.07/12.75	5.95/6.35	7.39/7.14	7.49/7.17	6.7/6.04	4.56/3.07	3.32/3.63	4.41/7.36	8.89/7.34	6.63/6.16	4.11/4.73	5.91/6.81	8.38/6.91	3.89/4.42	5.39/7.25	11.36/14.09	12.68/8.5	6.36/5.45	5.49/6.06	6.45/5.58	8.09/10.43	7.57/4.42
Theta	4.03/4.81	7.52/5.64	9.57/11.77	6.15/13.56	9.07/6.79	5.27/4.92	6.71/8.21	8.36/4.66	2.86/3.98	4.31/5.94	6.26/3.62	4.29/6.26	3.24/2.24	3.71/5.58	4.15/1.96	4.48/4.11	4.34/8.27	10.77/9.82	6.55/7.85	6.59/3.16	2.06/1.53	1.2/2.72	4.61/4.05	3.93/3.56
Theta	1.25/2.64	6.19/8.77	8.38/9.32	5/12.34	11.7/10.71	6.58/4.2	5.45/6.36	7.43/4.62	2.65/4.06	4.65/3.91	3.65/1.9	1.63/3.6	2.52/1.65	2.18/4.37	3.76/1.97	3.24/4.98	5.09/13.03	11.49/10.08	7.44/4.04	6.76/4.45	1.14/1.27	0.14/0.37	2.06/2.66	1.92/0.86
Theta	0.27/2.95	3.05/3.3	7.71/4.26	2.26/11.03	11.81/16.68	17.63/10.26	8.02/8.51	9.09/5.37	2.6/2.93	3.57/1.42	0.53/2.04	0.45/1.94	2.14/1.9	2.29/2.44	1.99/3.44	4.14/5.55	4.72/9.1	5.53/7.08	3.84/1.63	4.54/2.92	1.02/1.18	0.35/0.68	0.78/1.55	1.60/5.1
Theta	2.22/6.43	4.58/6.27	11.01/3.8	5.23/17.32	15.91/18.3	17.89/13	10.83/12.13	6.93/7.46	4.73/3.22	3.29/2.06	0.61/1.08	2.18/1.35	1.61/0.72	0.65/1.39	2.15/4.94	3.26/4.5	4.58/14.86	10.87/13.25	2.92/1.22	2.7/4	0.5/0.21	0.94/0.45	2.77/1.21	1.94/0.61
Theta	4.09/7.06	3.75/6.88	11.39/6.62	8.44/12.11	15.12/18.98	14.25/13.76	11.74/17.71	17.25/11.4	6.53/4.15	3.13/1	0.88/2.4	2.12/0.67	0.24/0.64	0.85/0.21	1.56/4.14	3.14/3.87	3.48/8.21	7.03/13.97	4.22/1.22	2.33/3.18	0.02/1.57	1.33/0.68	2.9/1.41	1.01/0.86
Theta	7.02/7.79	3.8/6.73	9.74/8.96	9.51/8.68	13.76/14.29	18.48/15.1	16.87/17.81	16.92/12.61	8.82/3.13	3.1/1.99	1.92/2.1	1.02/2.28	1.96/1.39	2.02/3.67	3.73/3.1	2.14/5.39	3.23/12.48	1.262/31	2.67/5.23	0.181/83	2.07/0.46	7.32/3.22	1.16/1.67	1.16/1.67
Theta	5.23/17.16	11.79/9.64	12.58/10.67	15.54/15.7	16.19/14.93	15.11/18.19	12.58/11.31	10.98/8.05	4.74/3.88	3.38/3.02	1.25/0.85	0.85/1.26	1.23/0.53	1.43/1.16	5.2/2.74	6.77/1.31	3.22/6.2	2.17/10.32	4.07/4.69	0.21/0.87	0.54/0.31	4.6/8.79	1.71/0.89	1.71/0.89
Theta	6.08/18.48	13.64/10.02	18.49/10.67	12.55/14.51	17.09/10.66	8.71/8.15	9.65/9.77	8.98/9.14	8.42/7.63	6.95/5.36	2.45/1.27	2.7/2.3	0.64/0.1	0.37/1.06	10.11/2.73	7.62/0.15	4.05/2.06	2.6/1.08	9.93/9.9	2.35/8.4	2.91/1.16	3.46/2.03	6.13/12.49	3.9/0.9
Theta	5.35/12.36	9.78/7.49	12.53/9.05	7.49/8.29	15.34/15.85	13.21/12.16	11.92/13.53	11.58/11.87	15.83/12.01	7.93/4.56	3.16/3.14	4.17/3.27	1.73/1.47	2.24/2.77	3.3/5.56	4.89/3.81	13.22/6.49	8.12/15.2	3.52/0.5	3.88/10.02	7.35/4.15	5.54/5.43	7.19/10.05	6.2/2.85
Theta	7.83/8.55	3.95/9.02	13.47/18.95	11.5/9.21	9.74/14.2	18.19/18.97	16.97/16.33	18.14/16.75	14.50/13.88	5.87/3.62	2.86/2.74	3.18/3.17	2.59/2.73	3.6/2.99	4.24/5.15	2.86/6.01	9.25/4.95	5.89/14.78	8.81/4.34	5.91/10.48	14.48/13.64	8.73/6.3	5.5/5.86	7.21/7.9
Theta	4.78/5.22	4.56/7.38	10.39/12.93	12.62/11.55	13.57/16.83	17.17/16.87	12.34/10.57	10.02/10.59	10.6/7.18	3.72/2.24	1.49/1.26	1.86/3.32	3.93/3.5	2.44/2.51	4.82/4.92	5.92/12.86	8.84/7.31	7.96/13.97	11.74/6.51	7.88/16.11	17.84/17.96	14.26/14.24	12.01/8.44	7.45/8.74
Theta	16.3/8.84	7.81/7.53	9.56/11.36	11.24/10.93	10.91/10.72	11.84/16.25	18.26/18.4	19.04/14.52	9.31/5.79	4.4/3.48	2.59/2.44	3.81/6.54	7.15/5.58	3.78/3.75	5.08/6.27	8.36/6.66	7.73/6.46	5.9/8.64	5.07/11.1	12.49/13.34	16.57/10.48	4.79/6.52	7.69/16.07	7.69/16.07
Theta	15.5/14.77	14.53/16.78	18.87/18.99	17.57/18.67	18.71/17.14	18.52/19.32	18.13/17.76	16.93/14.25	10.97/8.57	7.32/6.94	17.77/9.13	11.5/13.77	12.58/9.82	7.64/8.03	8									



Radiated Composite Gain of 2.4GHz and 5GHz UNII 1~3

Appendix A

Theta	18.97	18.46	17.64	19.11	18.16	17.59	15.35	12.16	11.05	10.41	10.31	9.91	10.37	12.41	15.06	16.95	18.34	18.37	18.86	15.94	15.94	13.76	15.53	14.56	13.13	14.31	12.43	16.53	16.62	16.11	13.41	16.12	17.39	17.66	15.58	13.55	12.41	10.68	10.53	12.41	17.93	18.62	15.53	15.87	18.46	17.68	17.67		
Theta(75)	-18.97	-18.46	-17.64	-19.11	-18.16	-17.59	-15.35	-12.16	-11.05	-10.41	-10.31	-9.91	-10.37	-12.41	-15.06	-16.95	-18.34	-18.37	-18.86	-15.94	-15.94	-13.76	-15.53	-14.56	-13.13	-14.31	-12.43	-16.53	-16.62	-16.11	-13.41	-16.12	-17.39	-17.66	-15.58	-13.55	-12.41	-10.68	-10.53	-12.41	-17.93	-18.62	-15.53	-15.87	-18.46	-17.68	-17.67		
Theta(82.5)	-18.21	-19.42	-17.22	-18.64	-18.11	-18.36	-19.04	-18.58	-17.44	-16.36	-14.29	-14.2	-15.47	-16.84	-16.86	-16.45	-16.68	-17.89	-17.55	-18.41	-12.74	-12.81	-13.09	-15.21	-12.7	-14.4	-14.3	-14.7	-18.97	-14.93	-13.06	-12.46	-13.5	-13.3	-13.27	-14.58	-11.28	-10.18	-11.2	-13.47	-18.62	-17.16	-13.6	-11.47	-19.18	-18.2	-19.16		
Theta(90)	-17.26	-17.33	-19.03	-18.51	-18.13	-17.66	-18.58	-18.7	-12.22	-17.46	-16.56	-16.3	-17.67	-18.04	-18.76	-17.19	-17.03	-18.49	-16.71	-19.37	-17.67	-15.64	-15.22	-12.62	-15.23	-17.17	-17.84	-18.98	-18.49	-13.81	-13.43	-12.65	-15.76	-13.8	-14.23	-14.86	-14.9	-17.06	-17.07	-18.91	-15.04	-18.18	-18.54	-18.19	-17.91	-18.78			
Theta(97.5)	-18.04	-18.65	-14.11	-18.34	-18.6	-14.74	-14.07	-19.02	-18.55	-18.25	-17.63	-18.72	-18.19	-18.98	-15.83	-15.28	-18.05	-18.27	-17.81	-18.93	-16.66	-18.17	-17.45	-15.46	-17.52	-18.52	-19.15	-19.32	-19.15	-17.79	-15.66	-18.22	-16.2	-17.98	-17.25	-15.97	-19.09	-19.12	-16.49	-19.54	-17.49	-18.59	-16.27	-18.27	-17.46	-18.33	-18.54		
Theta(105)	-13.96	-11.54	-8.28	-16.01	-12.19	-10.33	-11.57	-16.06	-19.08	-17.15	-18.94	-18.83	-14.83	-12.07	-10.39	-10.13	-10.45	-13.33	-17.88	-18.73	-18.42	-16.87	-15.64	-14.47	-12.7	-10.13	-12.34	-14.41	-14.89	-16.14	-19.01	-18.57	-18.53	-17.43	-17.9	-15.31	-19.07	-19.3	-17.28	-19.07	-14.06	-12.44	-12.6	-17.47	-19.18	-18.99	-18.9		
Theta(112.5)	-8.19	-9.37	-4.98	-11.54	-10.46	-8.37	-10.21	-10.06	-15.54	-16.77	-14.37	-12.67	-11.55	-10.08	-9.47	-9.96	-11.39	-14.63	-17.31	-18.42	-18.39	-18.12	-16.82	-15.04	-13.71	-13.29	-17.44	-16.08	-15.13	-15.67	-17.79	-10.59	-9.03	-10.73	-14.04	-10.93	-11.03	-17.07	-18.53	-15.49	-15.86	-14.88	-17.29	-16.06	-12.77	-15.86	-18.54	-15.12	
Theta(120)	-6.85	-6.54	-7.73	-12.44	-12.98	-10.06	-10.07	-10.88	-12.3	-15.02	-15.68	-13.01	-10.52	-9.69	-9.85	-10.57	-12.18	-13.54	-19.53	-18.14	-18.09	-15.42	-13.69	-18.24	-14.58	-12.64	-17.1	-14.53	-14.67	-16.71	-14.15	-19.18	-6.79	-6.8	-12.04	-14.04	-9.7	-14.28	-19.25	-14.47	-18.53	-15.14	-18.37	-19.28	-12.51	-15.21	-18.37	-9.39	
Theta(127.5)	-5.27	-7.16	-8.43	-12.95	-12.73	-13.93	-12.83	-16.82	-18.15	-18.53	-17.33	-16.85	-13.54	-11.87	-12.26	-14	-15.25	-16.87	-19.02	-17.33	-13.67	-12.31	-12.56	-14.47	-13.55	-17.39	-14.16	-10	-12.18	-16.77	-15.36	-7.99	-4.92	-6.68	-10.37	-13.11	-9.67	-12	-18.94	-11.89	-17.62	-12.62	-13.17	-17.7	-17.13	-13.16	-10.71		
Theta(135)	-7.09	-7.64	-11.29	-14.88	-16.35	-14.93	-13.02	-13.47	-16.98	-17.66	-17.83	-13.63	-15.46	-18.1	-17.81	-17.04	-18.43	-18.03	-19.42	-18.79	-17.46	-13.38	-10.61	-12.39	-11.55	-11.81	-15.43	-15.66	-17.09	-18.09	-10.53	-9.03	-6.24	-5.99	-10.46	-17.9	-13.55	-11.97	-12.38	-9.9	-16.49	-11.63	-8.78	-16.73	-8.44	-12.17	-13.28	-10.53	
Theta(142.5)	-6.57	-7.1	-10.05	-10.56	-10.31	-10.88	-12.51	-13.89	-15.78	-16.97	-17.84	-17.81	-17.68	-16.76	-17.77	-17.18	-18.48	-18.19	-18.74	-17.97	-14.65	-12.39	-13.44	-15.6	-13.24	-14.87	-14.88	-10.95	-13.49	-9.79	-8.94	-9.5	-6.84	-10.6	-18.27	-18.43	-16.17	-11.22	-11.26	-10.35	-12.72	-11.71	-6.98	-10.82	-11.59	-13.28	-15.37	-9.39	
Theta(150)	-7.98	-7.58	-10.03	-12.57	-14.62	-14.77	-14.21	-14.99	-18.86	-18.32	-19.19	-14.2	-17.91	-18.09	-18.16	-17.68	-17.57	-18.34	-17.42	-17.42	-13.77	-14.83	-14.95	-18.72	-18.73	-17.99	-12.18	-10.59	-9.24	-9.07	-10.67	-9.03	-8.56	-14.74	-19.09	-17.5	-16.2	-10.96	-11.33	-11.69	-11.81	-13.72	-12.21	-14.05	-18.13	-19.92	-17.2	-18.2	-16.82
Theta(157.5)	-10.67	-7.77	-6.66	-8.45	-12.17	-15.9	-18.11	-17.02	-12.22	-18.46	-18.46	-17.78	-17.44	-18.11	-17.24	-18.33	-18.24	-16.27	-13.43	-12.17	-13.87	-17.17	-18.46	-17.59	-15.23	-13.05	-11.42	-10.97	-8.38	-8.8	-11.14	-13.19	-15.56	-17.86	-17.82	-18.09	-18.29	-16.39	-17.3	-18.15	-17.41	-17.19	-12.12	-17.72	-15.34	-13.17	-12.28	-10.79	
Theta(165)	-12.05	-11.32	-11.98	-14.35	-17.61	-17.85	-17.52	-18.91	-18.44	-18.32	-18.88	-18.4	-17.72	-17.86	-19.11	-19.24	-19.39	-15.15	-12.37	-10.67	-9.93	-9.75	-10.02	-11.46	-13.88	-13.73	-11.06	-9.03	-8.28	-9.03	-10.54	-11.96	-13.16	-14.44	-16.45	-17.82	-18.6	-18.33	-18.83	-16.3	-15.41	-15	-15.34	-16.18	-16.97	-18.5	-19.11	-15.59	
Theta(172.5)	-18.12	-16.57	-15.88	-15.17	-15.04	-17.34	-17.93	-18.81	-18.59	-18.41	-18.21	-17.63	-18.58	-18.84	-17.9	-18.46	-16.51	-14.86	-13.85	-13.25	-12.72	-12.49	-12.52	-12.44	-12.61	-12.52	-12.25	-11.84	-11.82	-12.17	-13.09	-13.9	-13.9	-14.71	-15.52	-16.77	-16.94	-19.12	-17.82	-17.63	-17.54	-19.29	-17.82	-16.68	-19.12	-17.82	-16.82		
Theta(180)	-10.88	-10.03	-10.56	-11.16	-12.55	-14.19	-16.76	-18.43	-18.37	-17.77	-18.14	-18.15	-19.17	-17.64	-18.71	-19.4	-19.04	-18.57	-18.23	-17.75	-17.91	-18.48	-17.38	-16.35	-16.03	-16.37	-17.66	-18.24	-17.39	-18.32	-18.47	-18.17	-19.14	-18.82	-18.71	-18.3	-18.94	-18.54	-18.86	-18.47	-15.66	-14.76	-13.99	-12.49	-12.99	-12.47			
Freq(Hz)	5.6GPol.	PhiAnt.3																																															
Gain	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(75)	8.6	9.66	10.07	9.8	10.06	10.1	11.83	12.37	12.27	12.06	11.94	11.35	10.62	9.97	9.53	9.36	8.95	8.84	8.73	8.83	8.87	9.22	9.84	10.41	10.93	11.44	11.72	12.07	13	14.01	15.28	16.28	17.19	15.14	13.97	12.51	11.86	9.99	9.72	9.85	9.41	9.09	8.57	8.16	7.76	7.36	6.96		
Theta(82.5)	8.58	9.6	10.04	10.5	11.47	12.6	14.4	16.38	17.14	17.09	16.63	14.87	13.61	12.23	11.6	10.78	10.32	9.58	9.16	8.82	8.84	8.97	9.23	9.6	10.13	10.17	10.4	10.53	10.82	11.11	11.38	11.84	12.07	12.37	12.36	11.38	10.31	10	9.47	9.26	9.07	9.25	9.48	9.11	8.72	8.71	8.81	8.5	
Theta(90)	8.2	8.41	9.26	10.54	12.9	14.71	15.83	16.6	15.71	13.43	10.98	9.64	8.61	7.84	7.23	6.76	6.45	6.21	6.08	5.81	6.02	6.25	6.66	7.39	7.97	8.3	8.68	9.38	9.81	10.14	10.92	11.18	13.09	15.15	17.45	21.22	11.96	9.56	8.13	7.29	7.02	7.14	7.49	7.25	6.86	6.79	7.36	7.36	
Theta(97.5)	6.49	6.86	8.27	9.48	12.13	13.08	13.12	11.52	9.97	9.46	6.75	6.57	4.88	4.26	4.04	3.99	4.14	4.08	4.31	4.39	4.45	4.57	4.71	4.08	4.84	5.88	6.48	6.98	7.11	7.22	7.37	7.39	7.36	6.55	5.15	4.45	4.09	5.01	5.53	5.47	5.33	4.47	4.56	4.64	4.7	4.96	5.12	5.34	5.47
Theta(105)	6.22	6.39	7.69	10.29	13.06	14.21	13.32	10.97	9.5	7.84	7.13	6.26	5.33	4.27	3.3	2.62	2.22	2.13	2.19	2.38	2.49	2.76	2.66	2.83	3.44	4.33	5.13	5.77	6.73	7.89	9.17	10.15	12.11	12.25	10.21	8.64	7.58	6.23	5.22	4.81	4.24	3.66	3.09	3.04	3.74	4.67	6.17	6.94	
Theta(112.5)	5.28	7.1	8.81	11.07	13.69	14.13	12.41	11.99	10.99	10.39	9.38	8.88	8.07	4.21	3.25	1.9	1.7	1.47	1.52	1.75	1.76	1.34	1.07	1.21	1.89	2.51	3.17	3.67	5.12	6.19	7.15	9.02	10.51	11.27	10.87	8.17	3.88	2.93	2.86	3.73	3.79	2.81	2.19	2.7	4.3	7.04			
Theta(120)	4.95	9.84	12.27	16.67	17.71	16.64	15.73	14.98	16.24	16.18	13.94	8.85	6.82	5.49	4.32	3.19	2.33	1.63	1.51	1.92	2.18	1.85	1.31	0.78	0.61	1.06	2.34	4.12	5.99	6.7	8.44	9.28	8.89	7.25	5.65	3.59	1.97	1.09	1.11	1.73	2.35	3.12	3.02	3.23	4.24	5.28	6.17		
Theta(127.5)	10.1	10.33	12.51	18.74	19.17	18.4	18.98	18.16	17.72	17.28	14.46	10.7	7.27	4.48	2.67	2.04	2.13	2.12	2.12	2.05	1.65	1.25	0.68	0.08	0.12	0.4	1.2	1.82	3.88	5.61	9.04	11.48	12.79	9.13	5.85	3.6	2.72	2.36	1.87	2.07	2.8	2.75	2.9						

