



Antenna Composite Gain Test Report

FCC ID	QXO-AP5020
Equipment	Access Point
Brand Name	Extreme Networks
Model Name	AP5020
Applicant	Extreme Networks, Inc. 2121 RDU Center Drive Morrisville North Carolina United States 27560
Manufacturer	Extreme Networks, Inc. 2121 RDU Center Drive Morrisville North Carolina United States 27560
Standard	KDB662911 D03 v01
Sample Received	Dec. 14, 2023
Start Test Date	Jan. 05, 2024
Final Test Date	Jan. 06, 2024

Approved by: Sam Chen

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1. Operation Mode and Antenna Information

Ant. No.	Antenna Position	Port					Brand	Model Name	Antenna Type	Connector	Modes of Operation
		WLAN 2.4GHz	WLAN 5GHz	WLAN 6GHz	Bluetooth / Zigbee	GPS					
1	2G5G Ant1	1	1	-	-	-	Sercomm	6172001TJH.20	PIFA	I-PEX	2.4GHz / 5GHz
2	2G5G Ant2	2	2	-	-	-	Sercomm	6172001TJH.21	PIFA	I-PEX	2.4GHz / 5GHz
3	2G5G Ant3	3	3	-	-	-	Sercomm	6172001TJH.22	PIFA	I-PEX	2.4GHz / 5GHz
4	2G5G Ant4	4	4	-	-	-	Sercomm	6172001TJH.23	PIFA	I-PEX	2.4GHz / 5GHz
5	6GAnt1	-	-	1	-	-	Sercomm	6172001TJH.24	PIFA	I-PEX	6GHz
6	6GAnt2	-	-	2	-	-	Sercomm	6172001TJH.25	PIFA	I-PEX	6GHz
7	6GAnt3	-	-	3	-	-	Sercomm	6172001TJH.26	PIFA	I-PEX	6GHz
8	6GAnt4	-	-	4	-	-	Sercomm	6172001TJH.27	PIFA	I-PEX	6GHz
9	5G6G Ant1	-	1	1	-	-	Sercomm	6172001TJH.28	PIFA	I-PEX	5GHz / 6GHz
10	5G6G Ant2	-	2	2	-	-	Sercomm	6172001TJH.29	PIFA	I-PEX	5GHz / 6GHz
11	BT/Zigbee	-	-	-	1	-	Sercomm	6172001TJH.30	PIFA	I-PEX	Bluetooth / Zigbee
12	BT/Zigbee	-	-	-	2	-	Sercomm	6172001TJH.31	PIFA	I-PEX	Bluetooth / Zigbee
13	BT/Zigbee	-	-	-	-	-	Sercomm	6172001TJH.32	PIFA	I-PEX	Bluetooth / Zigbee
14	GPS	-	-	-	-	1	Sercomm	6172001TJH.33	PIFA	I-PEX	GPS

Note 1: The Bluetooth / Zigbee function of Antenna 13 is not enabled at this time.

Note 2: There are only measured antenna gains of the WLAN 2.4GHz/5GHz/6GHz.

Note 3:

Radio 1

2.4GHz Operation Mode

For 2TX/2RX:

2G5GAnt1~2 can be used as transmitting/receiving antenna.

2G5GAnt1~2 could transmit/receive simultaneously.

For 2TX/4RX:

2G5GAnt1~4 can be used as receiving antenna, but only 2G5GAnt1~2 can be used as transmitting antenna.

2G5GAnt1~4 could receive simultaneously, but only 2G5GAnt1~2 could transmit simultaneously.

For 4TX/4RX:

2G5GAnt1~4 can be used as transmitting/receiving antenna.

2G5GAnt1~4 could transmit/receive simultaneously.

5GHz Operation Mode

UNII 1~UNII 3: 2RX

5G6GAnt1~2 can be used as receiving antenna.

5G6GAnt1~2 could receive simultaneously.

UNII1~UNII 2A: 2TX/2RX

5G6GAnt1~2 can be used as transmitting/receiving antenna.

5G6GAnt1~2 could transmit/receive simultaneously.

6GHz Operation Mode

For 2TX/2RX:

5G6GAnt1~2 can be used as transmitting/receiving antenna.

5G6GAnt1~2 could transmit/receive simultaneously.

Radio 2

5GHz Operation Mode

For 2TX/4RX:

2G5GAnt1~4 can be used as receiving antenna, but only 2G5GAnt1~2 can be used as transmitting antenna.

2G5GAnt1~4 could receive simultaneously, but only 2G5GAnt1~2 could transmit simultaneously.

For 4TX/4RX:

2G5GAnt1~4 can be used as transmitting/receiving antenna.

2G5GAnt1~4 could transmit/receive simultaneously.

Radio 3

2.4GHz Operation Mode

For 1TX/2RX:

2G5GAnt3~4 can be used as receiving antenna, but only 2G5GAnt3 can be used as transmitting antenna.

2G5GAnt3~4 could receive simultaneously.

For 2TX/2RX:

2G5GAnt3~4 can be used as transmitting/receiving antenna.

2G5GAnt3~4 could transmit/receive simultaneously.

6GHz Operation Mode

For 2TX/4RX:

6GAnt1~4 can be used as receiving antenna, but only 6GAnt1~2 can be used as transmitting antenna.

6GAnt1~4 could receive simultaneously, but only 6GAnt1~2 could transmit simultaneously.

For 4TX/4RX:

6GAnt1~4 can be used as transmitting/receiving antenna.

6GAnt1~4 could transmit/receive simultaneously.



2. Table for EUT Information

EUT	GPS Integrated Module
1	With
2	Without

Note 1: From the above EUTs, EUT 1 was selected as representative model for the test and its data was recorded in this report.

Note 2: The above information was declared by manufacturer.

3. Table for Radio Function

Radio	Support Band		
	2.4GHz	5GHz	6GHz
1	BW: 20MHz	2TX: UNII 1, 2RX: UNII 1&3 (scan) BW: 20/40/80MHz	UNII 5 or UNII 5~8 (scan) BW: 20/40/80/160MHz
2	-	UNII 3 or UNII 1&3 BW: 20/40/80MHz	-
3	BW: 20MHz	-	UNII 7~8 or UNII 5~8 BW: 20/40/80/160/320MHz
4	Bluetooth / Zigbee		
5	GPS		

Note: The above information was declared by manufacturer.



4. 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

5. 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	Vivi Jiang	24-24.5 / 40-55	Jan. 05, 2024 ~ Jan. 06, 2024

Note:

Testing Site Information

Brand Name: TDK

Dimension: 11m*6m*6m

Characteristic: Fully Anechoic Chamber

6. Test Facility and Configuration

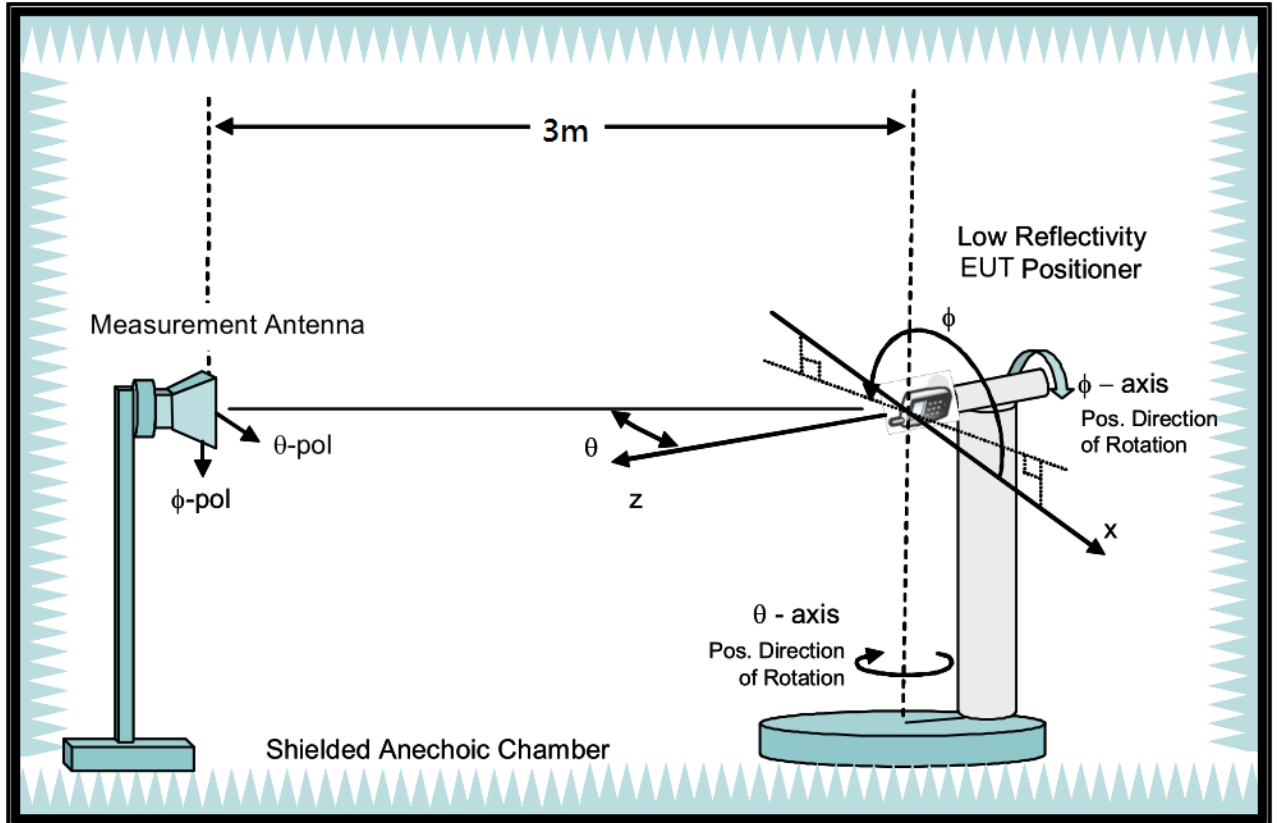
Test configuration: Reference to CITA OTA distributed-axes system configuration.

Chamber: Fully Anechoic Chamber.

Measurement antenna: Dual Polarization Horn antenna

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

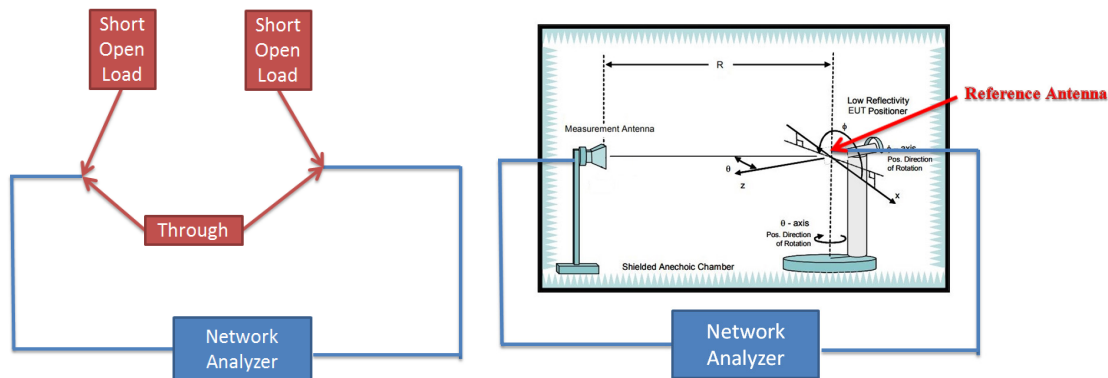
#Reference to CTIA "ctia-test-plan-for-wireless-device-over-the-air-performance-ver-3-7-1"



7. 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:

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

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

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

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



8. 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 9 tables.

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



9. Measured Values and Calculation of Maximum Gain Positions

For 2G5G Ant 1~4 (4TX):

DG_1SS max value position

Frequency (Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 (dBi)	-0.69	4.88	4.09	3.61	2.7
Ant. 2 (dBi)	1.66	3.19	-3.69	-2.3	2.89
Ant. 3 (dBi)	-3.41	2.99	3.71	4.27	-1.49
Ant. 4 (dBi)	1.45	-3.03	1.37	1.04	1.24
DG [1SS] (dBi)	6	8.49	7.89	8.04	7.52
Polarization	Theta	Theta	Theta	Theta	Theta
Θ (°)	52.5	67.5	67.5	75	75
Φ (°)	22.5	37.5	52.5	45	30

Note: The DG 1SS max value position is the maximum value of section 13 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^(-0.69/20)	10^(4.88/20)	10^(4.09/20)	10^(3.61/20)	10^(2.7/20)
Ant. 2 [10^(G/20)]	10^(1.66/20)	10^(3.19/20)	10^(-3.69/20)	10^(-2.3/20)	10^(2.89/20)
Ant. 3 [10^(G/20)]	10^(-3.41/20)	10^(2.99/20)	10^(3.71/20)	10^(4.27/20)	10^(-1.49/20)
Ant. 4 [10^(G/20)]	10^(1.45/20)	10^(-3.03/20)	10^(1.37/20)	10^(1.04/20)	10^(1.24/20)
Ant. 1 [10^(G/20)] value	0.924	1.754	1.601	1.515	1.365
Ant. 2 [10^(G/20)] value	1.211	1.444	0.654	0.767	1.395
Ant. 3 [10^(G/20)] value	0.675	1.411	1.533	1.635	0.842
Ant. 4 [10^(G/20)] value	1.182	0.706	1.171	1.127	1.153
Sum All Antenna [Amax]	3.991	5.314	4.959	5.045	4.755
DG [10*log(Amax^2/Nant)]	6	8.49	7.89	8.04	7.52

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 2G5G Ant 1~2 (2TX):

DG_1SS max value position

Frequency (Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 (dBi)	-0.65	4.88	3.99	2.78	2.7
Ant. 2 (dBi)	2.19	3.19	2.28	3.82	2.89
DG [1SS] (dBi)	3.9	7.09	6.19	6.33	5.81
Polarization	Theta	Theta	Theta	Theta	Theta
Θ (°)	45	67.5	75	67.5	75
Φ (°)	240	37.5	37.5	30	30

Note: The DG 1SS max value position is the maximum value of section 13 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^(-0.65/20)	10^(4.88/20)	10^(3.99/20)	10^(2.78/20)	10^(2.7/20)
Ant. 2 [10^(G/20)]	10^(2.19/20)	10^(3.19/20)	10^(2.28/20)	10^(3.82/20)	10^(2.89/20)
Ant. 1 [10^(G/20)] value	0.928	1.754	1.583	1.377	1.365
Ant. 2 [10^(G/20)] value	1.287	1.444	1.3	1.552	1.395
Sum All Antenna [Amax]	2.215	3.198	2.883	2.93	2.759
DG [10*log(Amax^2/Nant)]	3.9	7.09	6.19	6.33	5.81

Note:

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

Directional gain (1SS) = 10*log(10^(Gant1/20)+10^(Gant2/20)+ +10^(Gant3/20) +10^(Gant4/20)+.....)^2/Nant)



For 2G5G Ant 3~4 (2TX):

DG_1SS max value position

Frequency (Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 3 (dBi)	-3.69	4.1	3.57	4.3	1.51
Ant. 4 (dBi)	2.64	0.47	1.92	2.06	4.02
DG [1SS] (dBi)	3.05	5.48	5.79	6.26	5.87
Polarization	Theta	Theta	Theta	Theta	Theta
Θ (°)	60	75	75	75	82.5
Φ (°)	30	52.5	52.5	52.5	82.5

Note: The DG 1SS max value position is the maximum value of section 13 table DG 1SS Result.

DG_1SS max value position calculation

Frequency (Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 3 [$10^{(G/20)}$]	$10^{(-3.69/20)}$	$10^{(4.1/20)}$	$10^{(3.57/20)}$	$10^{(4.3/20)}$	$10^{(1.51/20)}$
Ant. 4 [$10^{(G/20)}$]	$10^{(2.64/20)}$	$10^{(0.47/20)}$	$10^{(1.92/20)}$	$10^{(2.06/20)}$	$10^{(4.02/20)}$
Ant. 3 [$10^{(G/20)}$] value	0.654	1.603	1.508	1.641	1.19
Ant. 4 [$10^{(G/20)}$] value	1.355	1.056	1.247	1.268	1.589
Sum All Antenna [Amax]	2.009	2.659	2.756	2.908	2.778
DG [$10 \cdot \log(A_{max}^2/N_{ant})$]	3.05	5.48	5.79	6.26	5.87

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 5G6G Ant 1~2 (2TX):

DG_1SS max value position

Frequency (Hz)	5.2G	5.3G	5.6G	5.785G	6.175G	6.475G	6.695G	6.995G
Ant. 1 (dBi)	3.07	0.37	2	1.42	1.33	0.98	2.92	-0.08
Ant. 2 (dBi)	-0.42	2.52	3.88	4.23	4.08	2.56	1.75	4.42
DG [1SS] (dBi)	4.51	4.52	6	5.95	5.82	4.82	5.36	5.47
Polarization	Theta	Theta	Theta	Theta	Theta	Theta	Theta	Theta
$\Theta(^{\circ})$	67.5	75	75	75	82.5	67.5	82.5	67.5
$\Phi(^{\circ})$	345	187.5	172.5	172.5	172.5	157.5	150	330

Note: The DG 1SS max value position is the maximum value of section 13 table DG 1SS Result.

DG_1SS max value position calculation

Frequency (Hz)	5.2G	5.3G	5.6G	5.785G	6.175G	6.475G	6.695G	6.995G
Ant. 1 [10 ^{^(G/20)}]	10 ^{^(3.07/20)}	10 ^{^(0.37/20)}	10 ^{^(2/20)}	10 ^{^(1.42/20)}	10 ^{^(1.33/20)}	10 ^{^(0.98/20)}	10 ^{^(2.92/20)}	10 ^{^(-0.08/20)}
Ant. 2 [10 ^{^(G/20)}]	10 ^{^(-0.42/20)}	10 ^{^(2.52/20)}	10 ^{^(3.88/20)}	10 ^{^(4.23/20)}	10 ^{^(4.08/20)}	10 ^{^(2.56/20)}	10 ^{^(1.75/20)}	10 ^{^(4.42/20)}
Ant. 1 [10 ^{^(G/20)}] value	1.424	1.044	1.259	1.178	1.165	1.119	1.4	0.991
Ant. 2 [10 ^{^(G/20)}] value	0.953	1.337	1.563	1.627	1.6	1.343	1.223	1.663
Sum All Antenna [Amax]	2.377	2.38	2.822	2.805	2.765	2.462	2.623	2.654
DG [10*log(Amax ² /Nant)]	4.51	4.52	6	5.95	5.82	4.82	5.36	5.47

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 6G Ant 1~4 (4TX):

DG_1SS max value position

Frequency (Hz)	6.175G	6.475G	6.695G	6.995G
Ant. 1 (dBi)	4.73	0.91	5.13	2.39
Ant. 2 (dBi)	1.84	4.42	3.91	5.39
Ant. 3 (dBi)	4.49	1.54	3.18	2.32
Ant. 4 (dBi)	1.23	3.65	1.18	1.87
DG [1SS] (dBi)	9.23	8.77	9.49	9.13
Polarization	Theta	Theta	Theta	Theta
Θ (°)	67.5	75	67.5	75
Φ (°)	330	60	345	180

Note: The DG 1SS max value position is the maximum value of section 13 table DG 1SS Result.

DG_1SS max value position calculation

Frequency (Hz)	6.175G	6.475G	6.695G	6.995G
Ant. 1 [$10^{(G/20)}$]	$10^{(4.73/20)}$	$10^{(0.91/20)}$	$10^{(5.13/20)}$	$10^{(2.39/20)}$
Ant. 2 [$10^{(G/20)}$]	$10^{(1.84/20)}$	$10^{(4.42/20)}$	$10^{(3.91/20)}$	$10^{(5.39/20)}$
Ant. 3 [$10^{(G/20)}$]	$10^{(4.49/20)}$	$10^{(1.54/20)}$	$10^{(3.18/20)}$	$10^{(2.32/20)}$
Ant. 4 [$10^{(G/20)}$]	$10^{(1.23/20)}$	$10^{(3.65/20)}$	$10^{(1.18/20)}$	$10^{(1.87/20)}$
Ant. 1 [$10^{(G/20)}$] value	1.724	1.11	1.805	1.317
Ant. 2 [$10^{(G/20)}$] value	1.236	1.663	1.569	1.86
Ant. 3 [$10^{(G/20)}$] value	1.677	1.194	1.442	1.306
Ant. 4 [$10^{(G/20)}$] value	1.152	1.522	1.146	1.24
Sum All Antenna [Amax]	5.789	5.49	5.961	5.723
DG [$10 \cdot \log(A_{max}^2/N_{ant})$]	9.23	8.77	9.49	9.13

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 6G Ant 1~2 (2TX):

DG_1SS max value position

Frequency (Hz)	6.175G	6.475G	6.695G	6.995G
Ant. 1 (dBi)	3.96	4.76	5.18	2.39
Ant. 2 (dBi)	4.77	2.31	4.8	5.39
DG [1SS] (dBi)	7.38	6.63	8	7.03
Polarization	Theta	Theta	Theta	Theta
Θ (°)	60	60	60	75
Φ (°)	0	0	345	180

Note: The DG 1SS max value position is the maximum value of section 13 table DG 1SS Result.

DG_1SS max value position calculation

Frequency (Hz)	6.175G	6.475G	6.695G	6.995G
Ant. 1 [$10^{(G/20)}$]	$10^{(3.96/20)}$	$10^{(4.76/20)}$	$10^{(5.18/20)}$	$10^{(2.39/20)}$
Ant. 2 [$10^{(G/20)}$]	$10^{(4.77/20)}$	$10^{(2.31/20)}$	$10^{(4.8/20)}$	$10^{(5.39/20)}$
Ant. 1 [$10^{(G/20)}$] value	1.578	1.73	1.816	1.317
Ant. 2 [$10^{(G/20)}$] value	1.732	1.305	1.738	1.86
Sum All Antenna [Amax]	3.309	3.034	3.553	3.177
DG [$10 \cdot \log(A_{max}^2/N_{ant})$]	7.38	6.63	8	7.03

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



10. Summary of Test Result

For 2G5G Ant 1~4 (4TX):

Freq(Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	2.91	4.88	4.99	5.07	5.29
Ant. 2 Max Gain (dBi)	3.17	3.95	3.41	5	5.07
Ant. 3 Max Gain (dBi)	2.98	4.49	4.06	4.4	3.93
Ant. 4 Max Gain (dBi)	2.64	4.75	4.07	4.71	4.4
Ant. 1 Polarization/ Θ (°)/ Φ (°)	Theta/67.5/105	Theta/67.5/37.5	Theta/45/22.5	Theta/45/15	Theta/52.5/15
Ant. 2 Polarization/ Θ (°)/ Φ (°)	Theta/52.5/232.5	Theta/52.5/277.5	Theta/45/285	Theta/82.5/285	Theta/45/300
Ant. 3 Polarization/ Θ (°)/ Φ (°)	Theta/45/195	Theta/67.5/52.5	Theta/52.5/90	Theta/67.5/52.5	Theta/52.5/82.5
Ant. 4 Polarization/ Θ (°)/ Φ (°)	Theta/60/30	Theta/52.5/150	Theta/52.5/157.5	Theta/52.5/142.5	Theta/52.5/142.5
Max Gain (dBi)	3.17	4.88	4.99	5.07	5.29
DG [1SS] (dBi)	6	8.49	7.89	8.04	7.52
DG [2SS] (dBi)	3.17	5.49	4.99	5.07	5.29
DG [4SS] (dBi)	3.17	4.88	4.99	5.07	5.29

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)



For 2G5G Ant 1~2 (2TX):

Freq(Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	2.91	4.88	4.99	5.07	5.29
Ant. 2 Max Gain (dBi)	3.17	3.95	3.41	5	5.07
Ant. 1 Polarization/ Θ (°)/ Φ (°)	Theta/67.5/105	Theta/67.5/37.5	Theta/45/22.5	Theta/45/15	Theta/52.5/15
Ant. 2 Polarization/ Θ (°)/ Φ (°)	Theta/52.5/232.5	Theta/52.5/277.5	Theta/45/285	Theta/82.5/285	Theta/45/300
Max Gain (dBi)	3.17	4.88	4.99	5.07	5.29
DG [1SS] (dBi)	3.9	7.09	6.19	6.33	5.81
DG [2SS] (dBi)	3.17	4.88	4.99	5.07	5.29

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)



For 2G5G Ant 3~4 (2TX):

Freq(Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 3 Max Gain (dBi)	2.98	4.49	4.06	4.4	3.93
Ant. 4 Max Gain (dBi)	2.64	4.75	4.07	4.71	4.4
Ant. 3 Polarization/ Θ (°)/ Φ (°)	Theta/45/195	Theta/67.5/52.5	Theta/52.5/90	Theta/67.5/52.5	Theta/52.5/82.5
Ant. 4 Polarization/ Θ (°)/ Φ (°)	Theta/60/30	Theta/52.5/150	Theta/52.5/157.5	Theta/52.5/142.5	Theta/52.5/142.5
Max Gain (dBi)	2.98	4.75	4.07	4.71	4.4
DG [1SS] (dBi)	3.05	5.48	5.79	6.26	5.87
DG [2SS] (dBi)	2.98	4.75	4.07	4.71	4.4

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)



For 5G6G Ant 1~2 (2TX):

Freq(Hz)	5.2G	5.3G	5.6G	5.785G	6.175G	6.475G	6.695G	6.995G
Ant. 1 Max Gain (dBi)	3.07	2.35	2.59	3.21	2.71	2.66	4.37	3.21
Ant. 2 Max Gain (dBi)	3.01	2.66	3.88	4.23	4.41	3.82	3.37	4.42
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/67.5/345	Theta/60/345	Theta/67.5/337.5	Theta/67.5/337.5	Theta/82.5/0	Theta/60/0	Theta/90/270	Theta/90/270
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/75/172.5	Theta/75/172.5	Theta/75/172.5	Theta/75/172.5	Theta/82.5/165	Theta/60/337.5	Theta/60/165	Theta/67.5/330
Max Gain (dBi)	3.07	2.66	3.88	4.23	4.41	3.82	4.37	4.42
DG [1SS] (dBi)	4.51	4.52	6	5.95	5.82	4.82	5.36	5.47
DG [2SS] (dBi)	3.07	2.66	3.88	4.23	4.41	3.82	4.37	4.42

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)



For 6G Ant 1~4 (4TX):

Freq(Hz)	6.175G	6.475G	6.695G	6.995G
Ant. 1 Max Gain (dBi)	5.33	4.93	5.5	4.83
Ant. 2 Max Gain (dBi)	5.41	4.54	5.26	5.39
Ant. 3 Max Gain (dBi)	5.95	5.96	4.82	4.77
Ant. 4 Max Gain (dBi)	5.79	5.88	5.89	5.91
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/67.5/352.5	Theta/67.5/345	Theta/60/0	Theta/67.5/307.5
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/52.5/7.5	Theta/60/225	Theta/67.5/285	Theta/75/180
Ant. 3 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/60/315	Theta/75/127.5	Theta/75/292.5	Theta/82.5/127.5
Ant. 4 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/75/60	Theta/75/157.5	Theta/75/165	Theta/75/157.5
Max Gain (dBi)	5.95	5.96	5.89	5.91
DG [1SS] (dBi)	9.23	8.77	9.49	9.13
DG [2SS] (dBi)	6.23	5.96	6.49	6.13
DG [4SS] (dBi)	5.95	5.96	5.89	5.91

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)



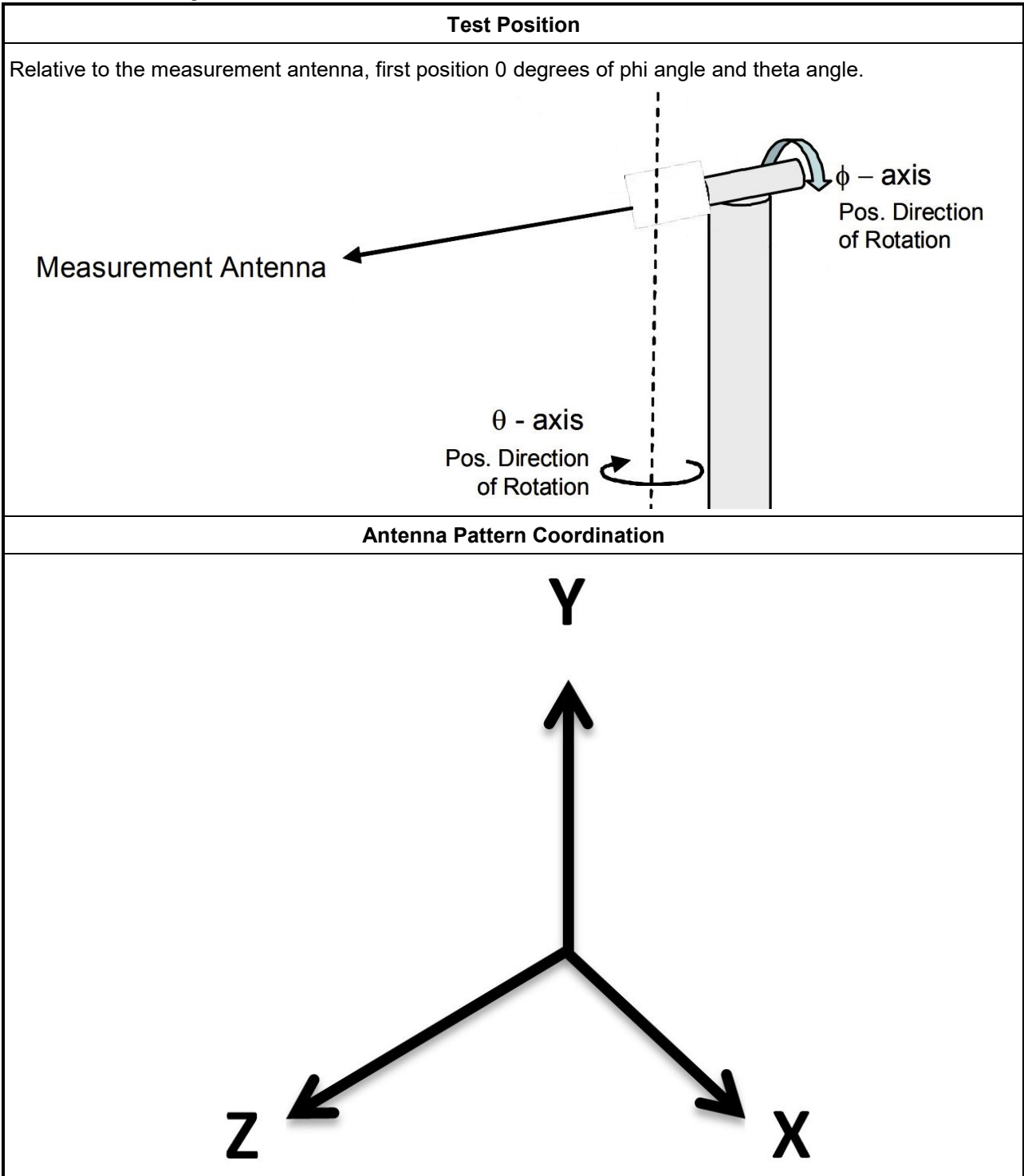
For 6G Ant 1~2 (2TX):

Freq(Hz)	6.175G	6.475G	6.695G	6.995G
Ant. 1 Max Gain (dBi)	5.33	4.93	5.5	4.83
Ant. 2 Max Gain (dBi)	5.41	4.54	5.26	5.39
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/67.5/352.5	Theta/67.5/345	Theta/60/0	Theta/67.5/307.5
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/52.5/7.5	Theta/60/225	Theta/67.5/285	Theta/75/180
Max Gain (dBi)	5.41	4.93	5.5	5.39
DG [1SS] (dBi)	7.38	6.63	8	7.03
DG [2SS] (dBi)	5.41	4.93	5.5	5.39

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)

11. Test Setup



Note:

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



12. 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.

N.C.R means Non-Calibration required.



13. Test Results

Please refer to the appendix.

Appendix A – Radiated Composite Gain of 2G5G (4TX).....Page 26

Appendix B – Radiated Composite Gain of 2G5G (2TX / Ant 1~2).....Page 40

Appendix C – Radiated Composite Gain of 2G5G (2TX / Ant 3~4).....Page 44

Appendix D – Radiated Composite Gain of 5G6G.....Page 48

Appendix E – Radiated Composite Gain of 6G (4TX).....Page 61

Appendix F – Radiated Composite Gain of 6G (2TX / Ant 1~2).....Page 72

Appendix G – Antenna Pattern of 2G5G.....Page 75

Appendix H – Antenna Pattern of 5G6G.....Page 82

Appendix I – Antenna Pattern of 6G.....Page 87

Appendix J – Test Photos.....Page 93



Freq(Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	2.91	4.88	4.99	5.07	5.29
Ant. 2 Max Gain (dBi)	3.17	3.95	3.41	5	5.07
Ant. 3 Max Gain (dBi)	2.98	4.49	4.06	4.4	3.93
Ant. 4 Max Gain (dBi)	2.64	4.75	4.07	4.71	4.4
Ant. 1 Polarization/ θ (°)/ ϕ (°)	Theta/67.5/105	Theta/67.5/37.5	Theta/45/22.5	Theta/45/15	Theta/52.5/15
Ant. 2 Polarization/ θ (°)/ ϕ (°)	Theta/52.5/232.5	Theta/52.5/277.5	Theta/45/285	Theta/82.5/285	Theta/45/300
Ant. 3 Polarization/ θ (°)/ ϕ (°)	Theta/45/195	Theta/67.5/52.5	Theta/52.5/90	Theta/67.5/52.5	Theta/52.5/82.5
Ant. 4 Polarization/ θ (°)/ ϕ (°)	Theta/60/30	Theta/52.5/150	Theta/52.5/157.5	Theta/52.5/142.5	Theta/52.5/142.5
Max Gain (dBi)	3.17	4.88	4.99	5.07	5.29
DG [1SS] (dBi)	6	8.49	7.89	8.04	7.52
DG [2SS] (dBi)	3.17	5.49	4.99	5.07	5.29
DG [4SS] (dBi)	3.17	4.88	4.99	5.07	5.29



Radiated Composite Gain Data_2G5G (4TX)

Appendix A

DG 1SS Result

Large table with columns for Freq(Hz), 2450Pol, Phi, and multiple DG(dB) entries for various configurations (e.g., Phi(7.5), Phi(15), etc.).



Radiated Composite Gain Data_2G5G (4TX)

Appendix A

Table with columns for frequency (MHz), power (W), and gain (dB) for various antenna configurations and frequencies. Includes sub-headers for Frequency (MHz), Power (W), and Gain (dB) for each antenna type.



Radiated Composite Gain Data_2G5G (4TX)

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(7.5°)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...



Radiated Composite Gain Data_2G5G (4TX)

Appendix A

Table with columns for Frequency (Freq(Hz)), Theta Ant 1, Gain, and various Phi angles (Phi(0) to Phi(35)). Rows include header information, gain data for various frequencies (5.785GPol, 2.45GPol, 5.2GPol), and a final section for 5.2GPol data with Theta Ant 2.



Radiated Composite Gain Data_2G5G (4TX)

Appendix A

Table with 26 columns representing frequency bands (ThetaAnt 1-26) and 26 rows representing frequency bands (ThetaAnt 1-26). Each cell contains gain data for a specific frequency pair. The table is divided into four sections by frequency ranges: 5.2GPol, 5.3GPol, 5.6GPol, and 5.8GPol.



Radiated Composite Gain Data_2G5G (4TX)

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°)
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	165	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	195	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	270	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	285	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	330	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	345	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	360	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Radiated Composite Gain Data_2G5G (4TX)

Appendix A

Theta	Phi	Phi Ant. 4	Phi Ant. 5	Phi Ant. 6	Phi Ant. 7	Phi Ant. 8	Phi Ant. 9	Phi Ant. 10	Phi Ant. 11	Phi Ant. 12	Phi Ant. 13	Phi Ant. 14	Phi Ant. 15	Phi Ant. 16	Phi Ant. 17	Phi Ant. 18	Phi Ant. 19	Phi Ant. 20	Phi Ant. 21	Phi Ant. 22	Phi Ant. 23	Phi Ant. 24	Phi Ant. 25	Phi Ant. 26	Phi Ant. 27	Phi Ant. 28	Phi Ant. 29	Phi Ant. 30	Phi Ant. 31	Phi Ant. 32	Phi Ant. 33	Phi Ant. 34	Phi Ant. 35	Phi Ant. 36	Phi Ant. 37	Phi Ant. 38	Phi Ant. 39	Phi Ant. 40	Phi Ant. 41	Phi Ant. 42	Phi Ant. 43	Phi Ant. 44	Phi Ant. 45	Phi Ant. 46	Phi Ant. 47	Phi Ant. 48	Phi Ant. 49	Phi Ant. 50	Phi Ant. 51	Phi Ant. 52	Phi Ant. 53	Phi Ant. 54	Phi Ant. 55	Phi Ant. 56	Phi Ant. 57	Phi Ant. 58	Phi Ant. 59	Phi Ant. 60
Theta	Phi	Phi Ant. 4	Phi Ant. 5	Phi Ant. 6	Phi Ant. 7	Phi Ant. 8	Phi Ant. 9	Phi Ant. 10	Phi Ant. 11	Phi Ant. 12	Phi Ant. 13	Phi Ant. 14	Phi Ant. 15	Phi Ant. 16	Phi Ant. 17	Phi Ant. 18	Phi Ant. 19	Phi Ant. 20	Phi Ant. 21	Phi Ant. 22	Phi Ant. 23	Phi Ant. 24	Phi Ant. 25	Phi Ant. 26	Phi Ant. 27	Phi Ant. 28	Phi Ant. 29	Phi Ant. 30	Phi Ant. 31	Phi Ant. 32	Phi Ant. 33	Phi Ant. 34	Phi Ant. 35	Phi Ant. 36	Phi Ant. 37	Phi Ant. 38	Phi Ant. 39	Phi Ant. 40	Phi Ant. 41	Phi Ant. 42	Phi Ant. 43	Phi Ant. 44	Phi Ant. 45	Phi Ant. 46	Phi Ant. 47	Phi Ant. 48	Phi Ant. 49	Phi Ant. 50	Phi Ant. 51	Phi Ant. 52	Phi Ant. 53	Phi Ant. 54	Phi Ant. 55	Phi Ant. 56	Phi Ant. 57	Phi Ant. 58	Phi Ant. 59	Phi Ant. 60
Gain	Phi Ant. 4	Phi Ant. 5	Phi Ant. 6	Phi Ant. 7	Phi Ant. 8	Phi Ant. 9	Phi Ant. 10	Phi Ant. 11	Phi Ant. 12	Phi Ant. 13	Phi Ant. 14	Phi Ant. 15	Phi Ant. 16	Phi Ant. 17	Phi Ant. 18	Phi Ant. 19	Phi Ant. 20	Phi Ant. 21	Phi Ant. 22	Phi Ant. 23	Phi Ant. 24	Phi Ant. 25	Phi Ant. 26	Phi Ant. 27	Phi Ant. 28	Phi Ant. 29	Phi Ant. 30	Phi Ant. 31	Phi Ant. 32	Phi Ant. 33	Phi Ant. 34	Phi Ant. 35	Phi Ant. 36	Phi Ant. 37	Phi Ant. 38	Phi Ant. 39	Phi Ant. 40	Phi Ant. 41	Phi Ant. 42	Phi Ant. 43	Phi Ant. 44	Phi Ant. 45	Phi Ant. 46	Phi Ant. 47	Phi Ant. 48	Phi Ant. 49	Phi Ant. 50	Phi Ant. 51	Phi Ant. 52	Phi Ant. 53	Phi Ant. 54	Phi Ant. 55	Phi Ant. 56	Phi Ant. 57	Phi Ant. 58	Phi Ant. 59	Phi Ant. 60	
Gain	Phi Ant. 4	Phi Ant. 5	Phi Ant. 6	Phi Ant. 7	Phi Ant. 8	Phi Ant. 9	Phi Ant. 10	Phi Ant. 11	Phi Ant. 12	Phi Ant. 13	Phi Ant. 14	Phi Ant. 15	Phi Ant. 16	Phi Ant. 17	Phi Ant. 18	Phi Ant. 19	Phi Ant. 20	Phi Ant. 21	Phi Ant. 22	Phi Ant. 23	Phi Ant. 24	Phi Ant. 25	Phi Ant. 26	Phi Ant. 27	Phi Ant. 28	Phi Ant. 29	Phi Ant. 30	Phi Ant. 31	Phi Ant. 32	Phi Ant. 33	Phi Ant. 34	Phi Ant. 35	Phi Ant. 36	Phi Ant. 37	Phi Ant. 38	Phi Ant. 39	Phi Ant. 40	Phi Ant. 41	Phi Ant. 42	Phi Ant. 43	Phi Ant. 44	Phi Ant. 45	Phi Ant. 46	Phi Ant. 47	Phi Ant. 48	Phi Ant. 49	Phi Ant. 50	Phi Ant. 51	Phi Ant. 52	Phi Ant. 53	Phi Ant. 54	Phi Ant. 55	Phi Ant. 56	Phi Ant. 57	Phi Ant. 58	Phi Ant. 59	Phi Ant. 60	



Freq(Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 1 Max Gain (dBi)	2.91	4.88	4.99	5.07	5.29
Ant. 2 Max Gain (dBi)	3.17	3.95	3.41	5	5.07
Ant. 1 Polarization/ $\theta(^{\circ})/\phi(^{\circ})$	Theta/67.5/105	Theta/67.5/37.5	Theta/45/22.5	Theta/45/15	Theta/52.5/15
Ant. 2 Polarization/ $\theta(^{\circ})/\phi(^{\circ})$	Theta/52.5/232.5	Theta/52.5/277.5	Theta/45/285	Theta/82.5/285	Theta/45/300
Max Gain (dBi)	3.17	4.88	4.99	5.07	5.29
DG [1SS] (dBi)	3.9	7.09	6.19	6.33	5.81
DG [2SS] (dBi)	3.17	4.88	4.99	5.07	5.29



Radiated Composite Gain Data_2G5G (2TX / Ant 1~2)

Appendix B

Theta (52.5°)	-6.1/-3.27	-2.12/-2.51	-3.95/-4.22	-5.56/-4.12	-4.73/-3.4	-6.64/-7.09	-3.91/-6.13	-1.95/-1.11	-4.3/-3.28	-4.07/-2.1	-3.86/-7.78	-4.97/-3.29	-1.85/-0.16	-1.6/-4.67	-2.65/-5.78	-8.22/-8.05	-10.67/-8.06	-3.32/-3.1	-5.56/-9.68	-10.4/-6.56	-2.64/-1.84	0.29/-0.15	-3.23/-0.26	0.69/-2.2
Theta (60°)	-2.1/-2.39	-2.21/-0.96	-1.74/-5.11	-5.48/-3.61	-6.1/-5.3	-6.63/-5.87	-2.96/-3.64	-0.83/-1.4	-3.92/-3.92	-4.98/-2.03	-3.51/-4.25	-3.5/-2.85	-1.04/-1.05	-1.66/-4.51	-3.22/-4.17	-6.77/-6.57	-8.54/-12.94	-7.8/-6.45	-8.67/-9.13	-11.03/-6.6	-4.07/-4.35	-3.43/-2.33	-2.50/18	-0.41/-1.19
Theta (67.5°)	-1.01/-2	-3.88/-0.61	-1.45/-5.33	-6.77/-4.89	-6.82/-8.28	-6.5/-4.25	-3.67/-3.61	-0.56/-2.22	-2.55/-3.57	-4.42/-2.3	-3.84/-3.8	-3.88/-3.1	-1.55/-1.19	-4.22/-5.37	-3.13/-5.33	-5.36/-9.09	-9.04/-13.63	-9.6/-7.12	-9.57/-10.28	-8.73/-5.99	-6.33/-6.46	-4.55/-2.8	-1.940.12	-0.710.73
Theta (75°)	-1.65/-3.56	-2.64/-0	-2.35/-5.94	-7.13/-8.96	-8.38/-10.44	-7.66/-4.09	-3.24/-3.86	-1.17/-3.12	-1.45/-2.77	-4.17/-2.82	-4.5/-4.21	-5.37/-2.84	-2.76/-1.88	-4.6/-4.92	-3.98/-3.96	-5.91/-10.36	-9.69/-12.33	-8.45/-6.21	-6.29/-8.92	-9.41/-5.46	-6.46/-6.34	-2.98/-2.67	-4.03/-1.63	-1.34/-0.32
Theta (82.5°)	-2.1/-4.06	-1.69/-0.96	-4.58/-5.69	-7.83/-10.36	-8.24/-13.16	-8.65/-5.41	-4.21/-6.34	-2.33/-2.93	-2.31/-4	-4.2/-3.51	-5.78/-5.15	-6.93/-4.21	-3.5/-3.09	-4.27/-5.21	-4.07/-4.82	-5.14/-14.23	-10.39/-11.75	-7.55/-4.47	-4.44/-6.85	-7.61/-5.98	-6.16/-6.04	-2.66/-3.21	-7.02/-5.14	-2.99/-2.53
Theta (90°)	-3.64/-3.78	-2.46/-2.95	-5.68/-6.83	-7.84/-12.43	-8.41/-11.34	-8.2/-5.86	-6.04/-7.78	-3.24/-4.18	-2.97/-4.94	-5.75/-5.03	-6.94/-6.29	-6.37/-6.44	-4.3/-3.18	-5.12/-5.6	-4.75/-4.79	-7.41/-15.06	-11.14/-10.73	-8.59/-5.93	-5.11/-6.86	-9.63/-7.3	-7.28/-7.54	-3.17/-5.27	-7.59/-7.77	-3.21/-4.2
Theta (97.5°)	-5.25/-4.3	-4.8/-5.19	-5.63/-7.63	-8.74/-12.45	-11.72/-14.74	-8.32/-7.21	-7.44/-8.85	-5.6/-5.24	-4.73/-7.63	-6.96/-6.78	-8.1/-9.03	-7.95/-7.94	-6.71/-2.8	-5.58/-7.89	-4.42/-5.38	-7.18/-12.3	-11.32/-12.3	-12.64/-10.54	-7.78/-8.62	-12.78/-11.06	-9.75/-9.78	-5.69/-11.36	-8.25/-8.33	-3.84/-6.96
Theta (105°)	-4.93/-5.03	-6.74/-7.06	-8.34/-8.32	-11.81/-13.89	-13.04/-14.36	-9.04/-7.46	-7.3/-9.25	-5.46/-6.76	-6.32/-9.55	-8.3/-8.91	-10.42/-10.25	-8.62/-10.77	-8.18/-4.29	-7.17/-7.62	-6.33/-6.16	-9.75/-13.73	-9.58/-9.73	-14.03/-11.64	-10.87/-10.31	-9.52/-12.69	-14.85/-12.88	-10.96/-13.53	-9.07/-8.52	-4.97/-9.27
Theta (112.5°)	-5.97/-7.7	-10.67/-7.74	-9.52/-13.47	-13.74/-13.68	-15.16/-12.84	-8.66/-7.23	-8.51/-9.58	-7.9/-8.78	-8.68/-10.99	-8.65/-10.54	-12.19/-12.8	-9.25/-9.84	-8.94/-4.62	-8.78/-8.1	-6.26/-6.57	-7.45/-8.97	-11/-13.9	-12.47/-9.57	-12.58/-12.13	-11.38/-12.21	-9.95/-9.53	-11.34/-11.76	-10.61/-10.02	-6.59/-10.03
Theta (120°)	-10.29/-9.93	-11.34/-10.01	-12.12/-13.97	-11.27/-12.05	-13.43/-8.69	-7.69/-9.3	-8.73/-9.7	-8.16/-10.05	-10.76/-14.16	-11.77/-10.26	-14.55/-12.51	-7.95/-12.16	-9.77/-4.96	-7.23/-7.58	-8.05/-8.49	-9.36/-8.76	-7.58/-11.59	-11.75/-8.88	-11.15/-13.67	-12.45/-12.15	-9.39/-12.82	-10.46/-12.35	-12.16/-9.77	-11.71/-9.05
Theta (127.5°)	-14.98/-11.26	-13.52/-10.48	-10.33/-11.3	-7.77/-11.48	-10.47/-7.69	-8.43/-14.7	-8.43/-9.64	-9.77/-8.89	-13.17/-14.61	-14.86/-14.32	-11.68/-12.35	-8.61/-8.74	-13.5/-12.47	-6.61/-7.59	-9.95/-7.69	-6.47/-12.32	-14.31/-12.71	-6.62/-9.89	-15.93/-15.16	-14.68/-9.99	-15.4/-15.91	-7.27/-15.34	-10.26/-13.02	-14.93/-8.79
Theta (135°)	-12.29/-10.85	-10.45/-12.46	-9.05/-11.04	-10.4/-11.59	-8.73/-9.21	-15.14/-9.89	-9.51/-14.23	-12.68/-12.43	-15.28/-13.06	-15.39/-15.58	-11.47/-12.82	-12.09/-10.06	-13.67/-15.88	-10.76/-10.06	-9.79/-9.42	-9.99/-12.19	-11.11/-10.65	-11.4/-8.66	-7.22/-9.02	-15.41/-9.14	-11.62/-10.62	-8.72/-12.54	-8.69/-11.25	-8.75/-5.99
Theta (142.5°)	-8.14/-7.3	-7.93/-9.17	-7.77/-11.12	-12.27/-13.64	-13.46/-13.24	-13.25/-12.57	-15.7/-14.81	-10.29/-11.65	-15.49/-14.68	-13.45/-15.53	-15.17/-15.8	-13.37/-9.68	-11.84/-11.95	-8.56/-13.7	-14.87/-15.14	-10.28/-10.84	-9.11/-10.29	-13.54/-13.94	-9.16/-9.69	-10.05/-11.97	-14.45/-10.71	-12.33/-12	-8.98/-9.23	-7.6/-5.33
Theta (150°)	-10.68/-6.31	-7.16/-10.07	-9.58/-9.07	-12.65/-10.99	-12.64/-13.27	-10.85/-11.01	-14.56/-12.69	-11.53/-13.59	-15.33/-14.72	-13.14/-14.85	-15.91/-15.62	-11.42/-10.84	-10.69/-13.34	-15.15/-14.77	-15.28/-15.91	-15.84/-14.62	-15.27/-12.97	-13.58/-12.08	-11.41/-14.47	-14.78/-12.7	-13.44/-14.82	-10.68/-10.61	-10.58/-10.61	-9.85/-9.08
Theta (157.5°)	-10.18/-12.64	-11.93/-9.76	-9.79/-11.11	-11.64/-10.32	-10.16/-13.42	-15.5/-15.44	-14.17/-12.18	-14.08/-15.53	-11.91/-11.11	-11.84/-15.23	-15.57/-15.28	-15.18/-15.69	-13.87/-12.32	-11.41/-12.27	-13.16/-12.54	-13.82/-13.99	-13.95/-14.34	-12.96/-13.9	-11.54/-11.5	-13.49/-14.13	-12.38/-14.07	-15.01/-15.4	-12.66/-10.31	-10.25/-8.55
Theta (165°)	-13.14/-10.51	-9.25/-12.04	-13.77/-12.8	-9.81/-9.77	-11.08/-11.74	-10.93/-12.08	-12.98/-15.52	-15.27/-15.19	-14.96/-14.08	-13.47/-15.45	-15.06/-14.72	-12.18/-12.2	-13.65/-13.73	-16.07/-14.14	-13.04/-12.98	-15.67/-14.53	-12.15/-11.07	-10.74/-14.41	-15.26/-14.83	-15.71/-13.97	-14.77/-15.83	-14.86/-11.89	-9.39/-10.93	-12.43/-12.2
Theta (172.5°)	-12.71/-11.82	-11.52/-11.62	-11.14/-12.08	-12.43/-13.15	-13.64/-13.67	-13.79/-13.49	-14.49/-15.74	-15.27/-15.06	-16.66/-12.53	-11.31/-10.33	-9.91/-10.05	-9.42/-9.83	-11.16/-12.47	-14.26/-15.43	-15.31/-13.63	-12.57/-9.87	-9.3/-10.22	-12/-14.44	-14.91/-14.99	-14.87/-13.58	-11.31/-9.66	-8.65/-9.48	-10.75/-12.38	-13.71/-12.33
Theta (180°)	-14.43/-14.26	-13.73/-14.11	-13.68/-13.84	-13.84/-13.3	-13.73/-13.31	-13.55/-13.02	-13.24/-13.32	-14.08/-15.9	-15.23/-15.64	-14.7/-12.85	-12.67/-12.93	-15.36/-15.07	-15.11/-15.53	-15.4/-14.53	-15.64/-14.87	-15.17/-15.2	-15.49/-15.46	-14.78/-13.22	-13.07/-13.75	-15.69/-15.33	-15.51/-15.5	-15.46/-14.6	-13.33/-13.66	-15.53/-15.17
Freq(Hz)	5.785GPol.	Theta	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°)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°)	-6.07/-5.23	-4.25/-3.76	-3.21/-2.86	-2.82/-2.9	-3.13/-3.2	-3.64/-3.92	-5.02/-5.34	-6.61/-8.53	-8.3/-10.26	-9.86/-9.72	-9.67/-8.67	-8.53/-8.27	-7.36/-7.15	-5.86/-4.68	-4.19/-3.93	-3.73/-3.34	-3.22/-3.32	-3.97/-4.5	-5.33/-6.17	-7.28/-8.85	-9.99/-9.74	-9.86/-9.57	-8.66/-9.12	-8.42/-6.64
Theta (7.5°)	-9.57/-9.56	-8.49/-6.84	-5.32/-4.31	-3.55/-3	-3.01/-3.03	-3.61/-3.87	-3.88/-5.98	-7.13/-8.01	-7.99/-7.56	-8.95/-8.96	-8.82/-9.37	-9.42/-9.32	-7.35/-5.89	-5.35/-4.33	-3.14/-2.74	-2.99/-3.52	-3.66/-3.97	-4.51/-4.94	-5.76/-6.72	-7.92/-9.06	-9.23/-10.63	-10.61/-11.66	-11.71/-13.73	-12.33/-10.77
Theta (15°)	-6/-4.61	-3.29/-1.97	-1.24/-0.86	-1.1/-1.63	-1.96/-1.53	-1.18/-1.25	-1.92/-3.37	-6.19/-9.77	-9.76/-9.97	-9.29/-9.77	-8.92/-8.65	-10.36/-11.82	-11.87/-10.99	-9.6/-7.79	-6.33/-4.93	-4.01/-3.62	-2.96/-2.84	-2.33/-2.3	-2.16/-1.74	-2.41/-2.98	-3.81/-6.07	-7.71/-9.24	-10.68/-10.55	-9.17/-7.35
Theta (22.5°)	-2.53/-0.85	-0.06/-0.39	0.94/-1.41	1.01/-0.38	-1.82/-2.27	-2.28/-1.65	-1.78/-2.73	-4.05/-7.13	-9.07/-7.17	-7.49/-7.81	-7.58/-6.57	-6.77/-8.13	-7.74/-7.83	-8.5/-8.3	-7.25/-7.04	-6.61/-4.77	-3.18/-2.95	-2.03/-1.27	-1.18/-2.42	-3.93/-4.4	-4.12/-3.84	-4.57/-5.04	-5.19/-4.6	-5.49/-4.61
Theta (30°)	0.812/52	3.733/33	2.391/42	0.01/-1.25	-1.02/-1.87	-4.01/-3.5	-2.14/-2.63	-4.28/-7.27	-7.29/-5.13	-6.05/-6.7	-13.96/-11.39	-11.71/-9.9	-7.94/-8.38	-7.81/-7.47	-7.83/-5.19	-3.93/-3.53	-3.45/-3.24	-1.940.21	0.711/0.95	-1.94/-0.87	-0.53/-0.48	-0.82/-1.34	-3.23/-2.31	-1.48/-1.68
Theta (37.5°)	0.020/84	2.823/53	3.122/46	0.5/-1.59	-0.350/0.2	-0.42/-1.29	-1.35/-2.38	-4.67/-3.72	-2.33/-4	-3.9/-4.24	-4.01/-4.2	-4.45/-5.39	-6.13/-5.11	-2.61/-3.56	-6.26/-3.25	-2.8/-2.51	-0.94/-0.53	0.38/2.1	2.030/11	0.372/19	0.75/1.18	1/-1.17	-3.07/-2.57	-1.29/-0.5
Theta (45°)	3.314/15	4.164/61	4.664/27	3.311/65	1.620/83	-0.04/-0.09	-0.80/86	1.210/27	-0.49/-2.53	-0.830/15	0.970/73	-0.31/-1.27	-4.32/-3.46	-1.260/07	0.250/16	-1.68/-0.27	0.260/06	-0.220/17	1.771/61	3.044/01	4.115/15	3.341/68	-0.68/-1.46	1.46/2/27
Theta (52.5°)	3.56/5	4.514/59	5.254/44	3.731/86	2.70/63	-0.91/17	-0.532/21	2.971/67	-0.77/-2.44	-1.38/-0.78	-0.09/2.62	3.172/12	-0.82/-1.48	-0.36/1.09	0.94/1.89	-1.2/-0.81	0.76/1.75	2.050/68	2.612/65	3.433/71	3.454/28	2.40/54	2/1/23	1.532/93
Theta (60°)	2.112/64	2.392/44	4.112/64	3.442/34	1.950/95	0.792/14	-1.041/53	2.51/4	-0.150/33	-1.591/21	-0.772/03	2.971/57	-1.190/43	0.880/29	1.181/6	-1.10/31	0.872/65	2.991/18	0.821/63	2.1/1/49	-0.96/-1.21	-0.221/22	2.760/09	1.643/23
Theta (67.5°)	2.631/61	1.192/08	4.732/49	3.813/36	1.91/57	2.212/41	0.610/39	0.110/87	0.451/09	-1.330/16	-1.540/96	0.95/-2.64	-1.431/31	0.990/21	0.830/35	-2.470/34	1.362/01	2.712/03	0.390/59	1.381/68	-1.24/-0.28	1.761/12	2.790/53	2.214/06
Theta (75°)	3.28/35	1.823/42	5.813/15	2.813/43	1.860/73	1.993/07	2.3/-0.37	-2.66/1.09	1.010/94	-1.450/75	-0.750/48	1.5/-0.8	-0.71/-1.06	1.58/-0.13	-0.02/-0.65	-2.03/-0.93	1.091/82	2.62/34	1.46/0.91	1.91/85	0.38/2.59	2.310/18	2.050/9	1.813/81
Theta (82.5°)	3.373/59	1.893/92	5.362/96	1.372/21	1.48/-0.5	1.432/53	2.08/-1.74	-2.51/32	1.4/-0.28	-3.780/23	-0.870/84	1.920/73	-0.95/-2.56	0.48/-0.49	-0.73/-1.98	-1.15/-2.54	0.091/65	2.552/86	3.181/47	2.272/14	0.933/91	2.250/26	-1.220/05	



Freq(Hz)	2.45G	5.2G	5.3G	5.6G	5.785G
Ant. 3 Max Gain (dBi)	2.98	4.49	4.06	4.4	3.93
Ant. 4 Max Gain (dBi)	2.64	4.75	4.07	4.71	4.4
Ant. 3 Polarization/ θ (°)/ ϕ (°)	Theta/45/195	Theta/67.5/52.5	Theta/52.5/90	Theta/67.5/52.5	Theta/52.5/82.5
Ant. 4 Polarization/ θ (°)/ ϕ (°)	Theta/60/30	Theta/52.5/150	Theta/52.5/157.5	Theta/52.5/142.5	Theta/52.5/142.5
Max Gain (dBi)	2.98	4.75	4.07	4.71	4.4
DG [1SS] (dBi)	3.05	5.48	5.79	6.26	5.87
DG [2SS] (dBi)	2.98	4.75	4.07	4.71	4.4



Radiated Composite Gain Data_2G5G (2TX / Ant 3~4)

Appendix C

θ (22.5°)	-2.65/-2.49	-3.73/-5.77	-9.17/-14.53	-13.87/-8.38	-5.79/-3.84	-2.78/-2.52	-2.13/-1.39	-0.64/-0.61	-1/-1.9	-3.19/-5.63	-6.25/-4.78	-3.74/-4.47	-6.5/-8.03	-8.31/-7.69	-7.56/-8.48	-9.88/-10.34	-10.21/-7.45	-6.01/-5.79	-6.33/-7.21	-8.31/-9.93	-12.33/-11.18	-10.03/-8.18	-7.54/-7.37	-5.79/-3.8	
θ (30°)	-2.57/-2.55	-3.28/-4.52	-6.71/-11.1	-13.49/-8.58	-2.78/-2.52	-1.51/-3.46	-2.43/-0.08	0.6/-0.42	-2.3/-4.31	-5.75/-7.3	-7.55/-6.28	-5.05/-4.17	-3.68/-4.18	-6.57/-7.76	-9.04/-8.99	-7.05/-7.04	-5.57/-6.42	-5.2/-6.2	-5.44/-7.21	-4.12/-4.44	-5.87/-6.89	-5.73/-4.15	-4.38/-5.72	-5.62/-3.86	
θ (37.5°)	-3.79/-3	-1.21/-2.01	-5.4/-9.34	-8.11/-2.96	-1.00/-1.02	-1.21/-1.59	-2.29/-0.81	-0.29/-1.55	-3.38/-5.39	-6.96/-6.83	-8.06/-9.07	-8.02/-7.52	-6.43/-6.79	-8.17/-7.38	-6.37/-4.08	-6.18/-8.82	-4.84/-3.47	-4.31/-5.49	-5.48/-4.31	-3.01/-2.97	-3.93/-4.83	-3.73/-2.58	-2.28/-2.69	-2.97/-3.58	
θ (45°)	-3.99/-4.48	-2.46/-2.33	-7.63/-6.6	-4.96/-2.53	-0.26/-1.18	-1.58/-0.07	-0.81/-2.09	-2.86/-3.72	-5.48/-5.83	-5.95/-5.87	-4.68/-5.69	-9.41/-8.54	-6.12/-8.47	-6.04/-6.59	-5.17/-2.22	-4.25/-8.18	-4.26/-4.19	-5.49/-6.16	-6.15/-6.68	-4.57/-4.93	-4.89/-4.1	-3.22/-3.3	-3.15/-1.68	-0.86/-1.34	
θ (52.5°)	-2.79/-5.08	-3.49/-3.3	-5.52/-5.52	-4.44/-4.48	-2.03/-2.03	-0.25/-0.69	-0.13/-0.37	-3.6/-3.32	-3.81/-3.31	-3.89/-6.69	-3.19/-3.5	-6.81/-8	-8.34/-5.18	-1.64/-3.08	-6.89/-2.84	-6.29/-8.29	-5.14/-5.7	-5.56/-6.87	-9.57/-8.2	-7.77/-6.1	-7.77/-6.1	-3.59/-3.5	-4.71/-2.67	0.330/55	
θ (60°)	-2.98/-3.05	-3.69/-4.55	-3.81/-6.1	-3.14/-2.76	-1.17/-1.01	-1.14/-1.03	-0.02/-0.3	-0.91/-1.29	-2.14/-3.01	-1.9/-3.53	-2.7/-0.81	-2.69/-3.75	-1.15/-1.05	-2.99/-1.81	-6.85/-2.58	-6.82/-7.73	-4.15/-4.59	-6.08/-7.27	-9.89/-9.38	-6.76/-6.29	-3.62/-1.49	-2.11/-3.7	-1.27/-1.03	-1.27/-1.03	
θ (67.5°)	-3.72/-2.96	-3.21/-4.37	-3.45/-5.91	-3.4/-2.38	0.60/0.89	0.52/-1.3	1.340/0.53	-1.39/-0.73	-0.67/-2.04	-1.28/-2.37	-3.78/-1.15	-2.62/-4.03	-7.47/-10.55	-4.73/-3.35	-5.3/-1.85	-4.71/-6.78	-4.17/-4.48	-4.81/-5.29	-5.66/-7.36	-9.51/-8.25	-7.41/-6.72	-3.42/-2.19	-2.49/-3.45	-1.19/-0.95	
θ (75°)	-5.62/-4.76	-4.87/-4.32	-3.32/-7.09	-4.59/-2.79	-0.320/0.8	1.530/0.56	1.890/4.41	-2.09/-2.4	-0.34/-2.26	-3.3/-2.46	-4.18/-3.01	-2.55/-2.41	-4.61/-4.2	-5.39/-3.59	-5.11/-2.23	-4.13/-3.03	-3.95/-4.78	-5.31/-4.55	-3.67/-8.4	-8.2/-9.56	-5.67/-6.48	-4.18/-3.34	-3.27/-4.64	-3.35/-2.6	
θ (82.5°)	-7.06/-5.48	-6.22/-5.27	-4.64/-7.79	-5.86/-4.13	-0.73/-0.4	0.760/1.2	1.23/-2.09	-3.45/-5.89	-0.92/-1.96	-4.58/-3.27	-3.89/-1.41	-4.67/-3.99	-3.9/-3.52	-4.63/-5.16	-5.85/-1.89	-4.24/-4.58	-3.84/-4.93	-5.19/-5.09	-6.45/-6.94	-9.25/-6.14	-6.65/-6.95	-4.77/-4.69	-4.88/-5.36	-3.81/-3.23	
θ (90°)	-7.7/-6.6	-6.8/-7.58	-7.44/-9.64	-7.03/-7.49	-3.44/-2.99	-0.36/-1.08	-0.86/-1.48	-3.81/-6.91	-3.19/-3.65	-4.28/-4.57	-4.64/-2.82	-5.64/-4.9	-5.72/-4.12	-2.8/-6.5	-6.43/-3.38	-4.75/-6.33	-5.05/-6.15	-7.73/-6.27	-4.71/-10.95	-10.69/-6.11	-7.22/-7.63	-6.14/-7.6	-6.71/-7.87	-5.77/-5.05	
θ (97.5°)	-9.64/-8.09	-7.31/-10.14	-9.92/-10.32	-8.02/-8.33	-5.69/-5.49	-2.11/-1.48	-1.69/-2.7	-6.96/-7.86	-5.14/-4.85	-5.02/-8.29	-6.15/-3.8	-8.01/-8.18	-6.73/-5.71	-4.2/-9.05	-8.8/-6.31	-6.33/-7.22	-6.4/-6.7	-8.74/-8.62	-6.18/-10.37	-11.81/-8.53	-10.93/-9.89	-9.32/-9.7	-8.18/-7.28	-6.47/-7.1	
θ (105°)	-10.72/-9.36	-9.73/-12.21	-12.36/-13.23	-11.44/-12.43	-6.97/-6.21	-4.49/-3.51	-3.3/-4.42	-7.85/-7.89	-6.87/-6.77	-5.09/-10	-6.26/-6.22	-10.38/-11.59	-10.13/-6.51	-5.84/-9.67	-9.47/-8.53	-8.47/-10.92	-8.47/-10.92	-13.46/-11.16	-7.43/-13.33	-13.77/-13.91	-15.91/-12.29	-9.32/-12.1	-8.06/-9.68	-6.39/-9.4	
θ (112.5°)	-11.72/-8.75	-11.1/-15.68	-14.89/-13.59	-11.11/-13.28	-11.13/-8.14	-6.28/-4.22	-5.26/-5.26	-6.19/-6.75	-8.35/-8.37	-6.59/-10.85	-10.43/-12.44	-15.46/-13.39	-5.03/-5.62	-5.98/-12.5	-11.19/-11.5	-10.36/-12.21	-8.55/-10.79	-13.55/-12.77	-9.01/-14.58	-15.06/-14.66	-15.28/-13.44	-11.48/-12.05	-11.91/-13.8	-8.18/-9.93	
θ (120°)	-13.4/-10.67	-10.03/-12.51	-12.92/-15.07	-12.93/-13.42	-14.47/-14.27	-9.93/-5.29	-6.21/-5.98	-5.85/-6.22	-10.92/-11.01	-8.05/-7.83	-11.76/-13.64	-7.75/-6.2	-6.32/-6.2	-9.52/-9.46	-10.13/-10.12	-10.99/-10.81	-8.39/-11.3	-11.35/-15.69	-6.89/-11.69	-11.34/-14.7	-14.38/-13.84	-15.17/-15.48	-14.74/-12.42	-14.74/-12.42	
θ (127.5°)	-12.41/-13.04	-10.31/-14.44	-12.68/-13.02	-14.27/-14.67	-14.81/-13.65	-15.29/-7.3	-10.3/-8.62	-8.51/-9.08	-12.24/-12.67	-8.21/-8.89	-11.73/-8.66	-11.44/-13.51	-7.1/-8.08	-10.63/-14.6	-10.36/-11.54	-9.12/-14.12	-15.12/-11.01	-11.28/-13.08	-13.07/-11.6	-12.13/-15.18	-12.77/-13.33	-15.56/-14.89	-15.58/-12.09	-15.82/-14.5	
θ (135°)	-12.27/-10.99	-10.72/-13.1	-11.85/-13.05	-14.01/-11.3	-13/-13.92	-14.39/-13.58	-11.78/-11.52	-13.53/-13.72	-12.49/-13.89	-11.88/-11.84	-15.43/-9.05	-11.64/-13.85	-10.16/-11.09	-11.55/-12.23	-8.71/-6.57	-9.3/-9.59	-13.9/-7.52	-8.37/-12.27	-13.14/-11.3	-13.52/-14.31	-15.9/-14.11	-10.8/-14.25	-12.94/-13.46	-14.36/-14.19	
θ (142.5°)	-13.61/-12.7	-13.95/-14.82	-15.66/-14.91	-10.11/-12.51	-11.38/-6.96	-10.91/-15.26	-8.35/-7.78	-12.82/-10.33	-7.61/-6.16	-14.46/-10.88	-11.27/-10.23	-13.99/-12.1	-10.85/-12	-10.68/-14.05	-9.19/-8.42	-11.42/-10.25	-13.58/-12.43	-13.26/-9.32	-9.99/-12.54	-15.58/-12.57	-10.83/-14	-12.11/-12.58	-14.76/-15.66	-14.9/-15	
θ (150°)	-16.15/-15.12	-15.09/-13.82	-13.89/-11.7	-9.85/-12.51	-13.17/-7.28	-6.79/-11	-7.03/-4.56	-7.27/-12.29	-8.46/-12	-16.02/-10.53	-14.62/-11.63	-14.77/-15.63	-10.82/-11.73	-10.66/-15	-10.88/-10.33	-11.48/-10.14	-12.95/-11.58	-10.61/-11.15	-12.93/-12.54	-15.71/-13.98	-14.31/-15.8	-11.51/-12.58	-15.63/-15.72	-14.28/-15.4	
θ (157.5°)	-13.98/-11.24	-10.98/-11.47	-12.78/-13.2	-13.67/-13.17	-8.38/-5.56	-6.6/-10.11	-9.18/-7.04	-10.32/-15.87	-11.43/-10.75	-12.94/-15.67	-12.25/-10.5	-10.92/-11.45	-9.28/-9.05	-13.87/-12.18	-8.33/-7.94	-9.93/-10.28	-9.64/-10.01	-9.94/-9.41	-10.12/-12.49	-13.88/-15.56	-16.11/-15.25	-15.64/-15.25	-15.93/-15.03	-15.32/-15.41	
θ (165°)	-14.68/-14.78	-15.44/-15.03	-13.86/-13.4	-15.09/-13.67	-10.65/-8.89	-8.88/-9.83	-12.06/-12.62	-11.42/-9.69	-8.83/-10.18	-13.53/-15.51	-15.08/-14.45	-12.32/-8.78	-7.83/-10.03	-13.63/-15.59	-11.29/-11.02	-12.43/-14.35	-13.89/-12.51	-10.79/-10.32	-12.01/-15.01	-15.59/-15.43	-15.68/-14.84	-15.38/-14.14	-12.87/-12.12	-11.78/-15.03	
θ (172.5°)	-15.28/-15.28	-15.78/-14.68	-15.49/-15.26	-13.71/-11.94	-11.29/-10.26	-10.49/-12.31	-13.45/-12.8	-11.89/-10.81	-10.9/-9.53	-10.73/-12.86	-13.6/-13.8	-14.87/-15.36	-13.22/-15.52	-14.78/-14.79	-12.23/-11.2	-14.31/-11.34	-14.63/-12.85	-11.71/-11.34	-12.14/-10.1	-15.41/-15.17	-14.34/-13.7	-14.03/-14.86	-15.19/-13.76	-13.01/-15.03	
θ (180°)	-13.02/-13.04	-12.99/-13.64	-12.52/-12.89	-13.17/-13.28	-13.88/-14.06	-10.42/-14.61	-14.74/-13.82	-13.29/-13.38	-13.56/-13.95	-13.42/-13.56	-14.54/-14.78	-14.85/-14.06	-13.27/-13.42	-12.45/-11.7	-12.56/-13.36	-13.38/-13.88	-13.48/-12.38	-11.25/-12.71	-12.75/-12.31	-12.44/-13.11	-12.34/-11.32	-11.61/-13.82	-14.27/-12.98	-11.56/-12.31	
Freq(Hz)	5.63GPa	Theta	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi	Phi
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°)	
θ (0°)	-7.79/-7.99	-7.71/-7.24	-7.01/-6.74	-6.73/-6.67	-6.69/-6.47	-6.26/-5.96	-5.62/-5.72	-5.89/-6.11	-6.24/-6.62	-6.86/-6.99	-7.65/-6.85	-5.55/-4.74	-5.05/-5.61	-5.57/-5.74	-6.4/-6.39	-7.14/-7.37	-7.61/-7.53	-7.89/-8.31	-8.92/-9.74	-11.22/-11.69	-12.25/-11.9	-9.93/-9.21	-8.55/-9.35	-7.67/-7.28	
θ (7.5°)	-5.32/-5.45	-6.02/-5.99	-5.59/-5.36	-5.36/-5.64	-5.77/-6.28	-7.17/-8	-8.96/-12.94	-14.05/-14.65	-14.41/-14.41	-12.22/-9.85	-8.47/-8.55	-8.2/-7.5	-7.54/-7.69	-8.44/-8.12	-7.85/-7.9	-8.16/-8.37	-7.61/-6.6	-5.99/-5.15	-4.27/-3.93	-4.14/-4.45	-5.16/-5.38	-5.91/-6.09	-7.04/-6.84	-6.02/-5.64	
θ (15°)	-6.81/-7.02	-6.44/-6.88	-3.84/-2.96	-5.67/-4.24	-2.69/-3.21	-3.35/-3.53	-2.87/-2.94	-2.87/-2.57	-2.52/-2.73	-2.72/-3.75	-4.41/-4.72	-5.94/-7.66	-10.17/-13.27	-13.47/-13.49	-13.77/-14.56	-15.01/-13.57	-10.79/-10.18	-9.04/-8.59	-7.85/-6.69	-5.93/-5.39	-5.77/-6.4	-6.4/-6.6	-6.02/-5.64		
θ (22.5°)	-7.85/-5.71	-3.8/-2.64	-2.87/-3	-2.79/-2.64	-3.52/-5.04	-4.87/-3.59	-3.01/-2.89	-3.1/-2.95	-2.79/-2.94	-3.48/-2.76	-2.17/-1.59	-2.07/-3.19	-4.69/-6.11	-6.5/-6.97	-10.27/-12.82	-10.82/-8.82	-6.94/-6.55	-7.22/-8.24	-10.1/-9.1	-8.15/-7.82	-8.03/-8.12	-6.87/-5.55	-4.79/-5.09	-5.3/-6.73	
θ (30°)	-3.88/-2.45	-0.96/-0.52	1.11/-0.04	-0.96/-0.15	-1.82/-0.99	-1.53/-3.76	-7.78/-7.07	-1.82/-0.99	-1.53/-3.76	-7.78/-7.07	-1.82/-0.99	-1.53/-3.76	-7.78/-7.07	-1.82/-0.99	-1.53/-3.76	-7.78/-7.07	-1.82/-0.99	-1.53/-3.76	-7.78/-7.07	-1.82/-0.99	-1.53/-3.76	-7.78/-7.07	-1.82/-0.99	-1.53/-3.76	
θ (37.5°)	-0.080/0.34	-0.24/-0.28	0.830/29	-1.560/61	0.38/-2.54	-2.30/-0.62	-0.91/-3.03	4.95/-3.13	-0.560/0.7	-0.82/2.9	-1.220/55	0.5/-0.14	-0.87/-1.3	-0.57/0.24	-0.91/-1.78	-1.61/-2.31	-5.65/-3.59	-3.78/-4.13	-2.67/-1.62	-1.17/-1.23	-1.17/-1.89	-3.59/-3.96	-3.8/-4.8	-4.94/-4.2	
θ (45°)	1.52/-1.59	0.32/-1.08	-1.050/6	0.92/82	2.320/82	2.223/65	3.992/98	1.2/-0.26	0.510/5	-0.240/23	1.552/56	1.760/61	1.08/-0.21	-1.83/-0.22	0.440/0.4	0.2/-1.96	-2.34/-0.75	-1.59/-1.33	-0.32/-1.1	-2.91/-1.89	-0.2/-0.21	-2.23/-2.77	-2.08/-2.71	-1.79/-1.4	
θ (52.5°)	1.62/-1.31	1.130/63	-0.412/57	3.434/08	2.962/43	3.464/61	5.364/54	2.921/07	1.382/21	1.72/39	3.964/57	3.540/73	0.471/51	0.54/-0.15	0.950/9	-0.05/-2.77	-1.43/-9.01	-2.31/-1.7	-1.02/-1.65	-2.25/-0.57	0.680/3	-2.32/-3.06	-2.58/-4.28	-0.53/-0.6	
θ (60°)	2.191/32	0.521/66	1.403/4	4.724/77	2.932/32	2.283/03	0.070/44	1.512/05	0.060/09	2.944/42	4.281/72	3.150/15	1.39/-0.12	0.611/4	0.72/-0.77	-0.9/-1.92	-3.49/-3.47	-2.63/-1.66	-0.210/88	1.070/32	-1.19/-1.49	-2.17/-1.82	0.741/62		
θ (67.5°)	1.981/58	-0.371/84	2.732/72	4.265/63	3.732/99	3.173/82	1.56/-1.47	-0.022/39	1.382/71	2.151/74	3.734/29	4.12/81	-2.89/-1.53	0.74/-1.2	-0.67/0.57	0.370/78	-1.48/-2.15	-2.56/-1.75	-1.12/-0.27	0.140/17	0.3/-0.63	-1.44/-0.89	-1.07/10		
θ (75°)	0.80/74	-1.090/71	1.541/61	3.787/79	4.023/99	4.855/55	3.651/81	3.234/																	



Freq(Hz)	5.2G	5.3G	5.6G	5.785G	6.175G	6.475G	6.695G	6.995G
Ant. 1 Max Gain (dBi)	3.07	2.35	2.59	3.21	2.71	2.66	4.37	3.21
Ant. 2 Max Gain (dBi)	3.01	2.66	3.88	4.23	4.41	3.82	3.37	4.42
Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/67.5/345	Theta/60/345	Theta/67.5/337.5	Theta/67.5/337.5	Theta/82.5/0	Theta/60/0	Theta/90/270	Theta/90/270
Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$	Theta/75/172.5	Theta/75/172.5	Theta/75/172.5	Theta/75/172.5	Theta/82.5/165	Theta/60/337.5	Theta/60/165	Theta/67.5/330
Max Gain (dBi)	3.07	2.66	3.88	4.23	4.41	3.82	4.37	4.42
DG [1SS] (dBi)	4.51	4.52	6	5.95	5.82	4.82	5.36	5.47
DG [2SS] (dBi)	3.07	2.66	3.88	4.23	4.41	3.82	4.37	4.42