



Antenna Composite Gain Test Report

| | |
|-----------------|---|
| Equipment | Secured Wireless Access Point |
| Brand Name | FORTINET |
| Model Name | FortiAP 443Kxxxxxx, FAP-443Kxxxxxx, FORTIAP-443Kxxxxxx (Where "x" can be used as "A-Z", or "0-9", or "-", or blank for software changes or marketing purposes only) |
| Applicant | Fortinet, Inc. 899 Kifer Road, Sunnyvale, CA 94086, USA |
| Manufacturer | Fortinet, Inc. 899 Kifer Road, Sunnyvale, CA 94086, USA |
| Sample Received | Oct. 18, 2023 |
| Start Test Date | Oct. 30, 2023 |
| Final Test Date | Oct. 30, 2023 |


Approved by: Jackson Tsai

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1. Operation Mode and Antenna Information

| Antenna Position | RF Port | Brand Name | Model Name | Ant. Type | Connector | Modes of Operation |
|------------------|---------|------------|--------------|-----------|-------------|----------------------------|
| 2G5G Ant1 | 1 | AWAN | 7102A0668000 | Dipole | Reverse SMA | 2.4GHz, 5GHz, 5.9GHz |
| 2G5G Ant2 | 2 | AWAN | 7102A0668000 | Dipole | Reverse SMA | 2.4GHz, 5GHz, 5.9GHz |
| 2G5G Ant3 | 3 | AWAN | 7102A0668000 | Dipole | Reverse SMA | 2.4GHz, 5GHz, 5.9GHz |
| 2G5G Ant4 | 4 | AWAN | 7102A0668000 | Dipole | Reverse SMA | 2.4GHz, 5GHz, 5.9GHz |
| 6G Ant1 | 1 | AWAN | 7102A0667000 | Dipole | Reverse SMA | 6GHz |
| 6G Ant2 | 2 | AWAN | 7102A0667000 | Dipole | Reverse SMA | 6GHz |
| 6G Ant3 | 3 | AWAN | 7102A0667000 | Dipole | Reverse SMA | 6GHz |
| 6G Ant4 | 4 | AWAN | 7102A0667000 | Dipole | Reverse SMA | 6GHz |
| Scan Ant1 | 1 | AWAN | 7102A0669000 | Dipole | Reverse SMA | 2.4GHz, 5GHz, 5.9GHz, 6GHz |
| Scan Ant2 | 2 | AWAN | 7102A0669000 | Dipole | Reverse SMA | 2.4GHz, 5GHz, 5.9GHz, 6GHz |

Note:

2.4GHz,5GHz and 5.9GHz Operation Mode (4TX/4RX)

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

6GHz Operation Mode (4TX/4RX)

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

2.4GHz, 5GHz , 5.9GHz, 6GHz Operation Mode (2RX)

Scan Ant1~ Scan Ant2 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 |
| 5850-5895 | 5885 |
| 5925-6425 | 6175 |
| 6425-6525 | 6475 |
| 6525-6875 | 6695 |
| 6875-7125 | 6995 |

3. Testing Location

| Test Lab. : Sporton International Inc. Hsinhua Laboratory | | | | |
|---|---------------|--|---------------------------|----------------|
| <input checked="" type="checkbox"/> Wen 33rd.St. | ADD: | No.14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) | | |
| | TEL: | 886-3-318-0787 | FAX: | 886-3-318-0287 |
| Test Condition | Test Site No. | Test Engineer | Test Environment (°C / %) | Test Date |
| Radiated | 05CH03-HY | Rex Liao | 23.5~24.5°C / 50~55% | 30/Oct/2023 |

Note:

Testing Site Information

Brand Name: TDK

Dimension: 11m*6m*6m

Characteristic: Fully Anechoic Chamber

4. Test Facility and Configuration

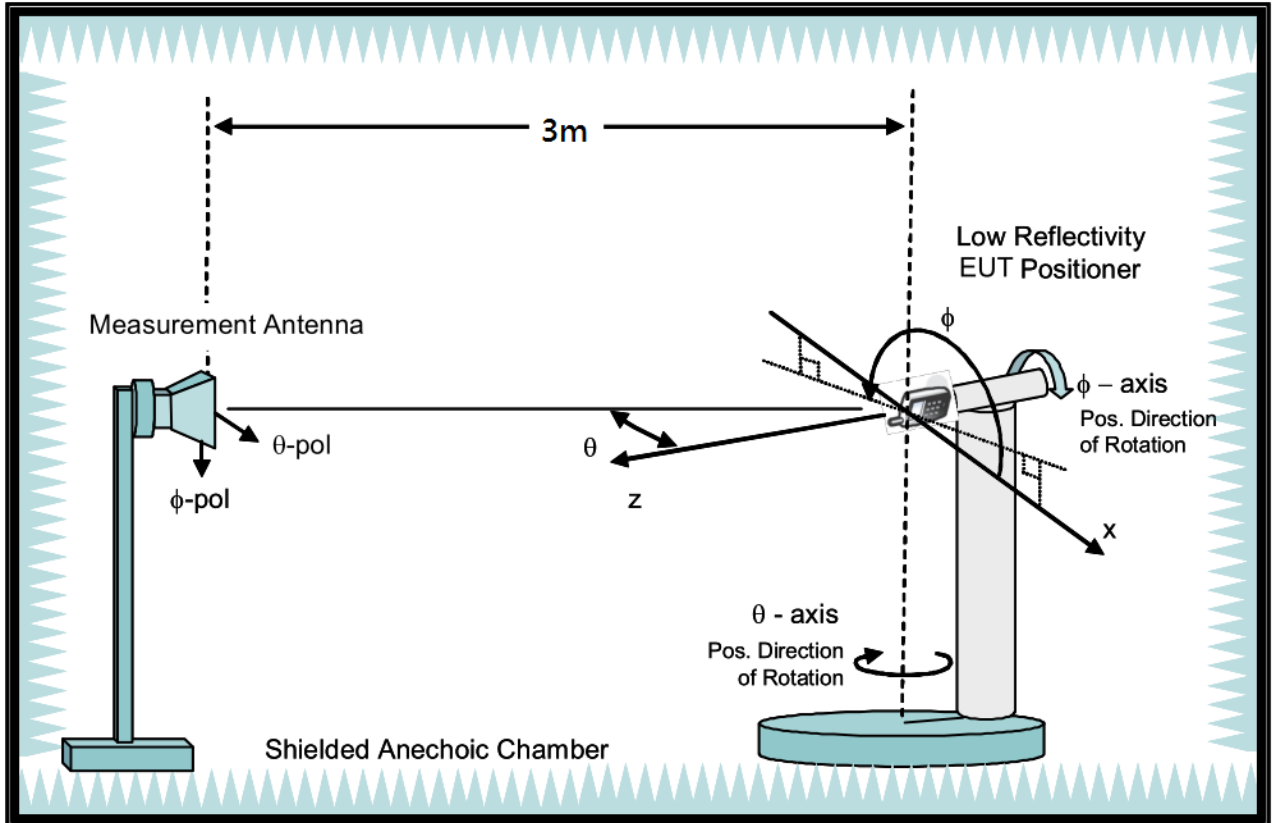
Test configuration: Reference to CITA OTA distributed-axes system configuration.

Chamber: Fully Anechoic Chamber.

Measurement antenna: Dual Polarization Horn antenna

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

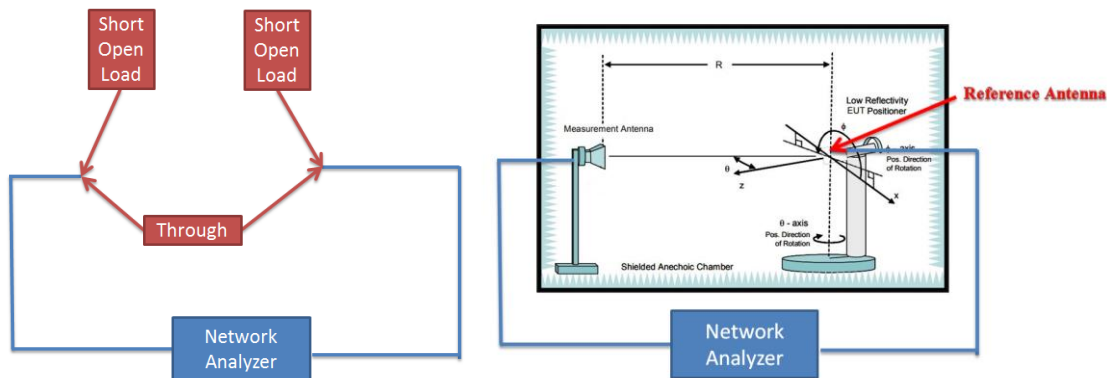
#Reference to CTIA “ctia-test-plan-for-wireless-device-over-the-air-performance-ver-3-7-1”



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

DG_1SS max value position

2G5G Ant.

| Frequency (Hz) | 2.45G | 5.2G | 5.3G | 5.6G | 5.785G | 5.885G |
|--------------------|-------|-------|-------|-------|--------|--------|
| Ant. 1 (dBi) | -3.03 | 2.68 | 2.04 | 1.77 | 3.88 | 2.84 |
| Ant. 2 (dBi) | 3.21 | 3.19 | 4.21 | 4.58 | 1.02 | 4.67 |
| Ant. 3 (dBi) | -4.13 | 3.91 | 1.38 | 4.69 | 3.94 | 4.61 |
| Ant. 4 (dBi)) | -0.25 | 0.9 | 3.4 | 0.35 | 3.83 | -0.09 |
| DG [1SS] (dBi) | 5.45 | 8.76 | 8.85 | 9.06 | 9.27 | 9.23 |
| Polarization | Theta | Theta | Theta | Theta | Theta | Theta |
| $\Theta(^{\circ})$ | 82.5 | 97.5 | 97.5 | 90 | 97.5 | 90 |
| $\Phi(^{\circ})$ | 127.5 | 247.5 | 30 | 300 | 135 | 315 |

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

6G Ant.

| Frequency (Hz) | 6.175G | 6.475G | 6.695G | 6.995G |
|--------------------|--------|--------|--------|--------|
| Ant. 1 (dBi) | 2.27 | -2.04 | -0.98 | 4.81 |
| Ant. 2 (dBi) | 0.13 | 1.48 | 2.74 | 1.5 |
| Ant. 3 (dBi) | 4.46 | 3.47 | 5.07 | -1.32 |
| Ant. 4 (dBi)) | 3.35 | 4.41 | 3.1 | 2.99 |
| DG [1SS] (dBi) | 8.72 | 8.18 | 8.76 | 8.3 |
| Polarization | Theta | Theta | Theta | Theta |
| $\Theta(^{\circ})$ | 90 | 90 | 90 | 97.5 |
| $\Phi(^{\circ})$ | 352.5 | 180 | 247.5 | 67.5 |

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



DG_1SS max value position calculation

2G5G Ant.

| Frequency (Hz) | 2.45G | 5.2G | 5.3G | 5.6G | 5.785G | 5.885G |
|--------------------------|---------------|--------------|--------------|--------------|--------------|---------------|
| Ant. 1 [10^(G/20)] | 10^(-3.03/20) | 10^(2.68/20) | 10^(2.04/20) | 10^(1.77/20) | 10^(3.88/20) | 10^(2.84/20) |
| Ant. 2 [10^(G/20)] | 10^(3.21/20) | 10^(3.19/20) | 10^(4.21/20) | 10^(4.58/20) | 10^(1.02/20) | 10^(4.67/20) |
| Ant. 3 [10^(G/20)] | 10^(-4.13/20) | 10^(3.91/20) | 10^(1.38/20) | 10^(4.69/20) | 10^(3.94/20) | 10^(4.61/20) |
| Ant. 4 [10^(G/20)] | 10^(-0.25/20) | 10^(0.9/20) | 10^(3.4/20) | 10^(0.35/20) | 10^(3.83/20) | 10^(-0.09/20) |
| Ant. 1 [10^(G/20)] value | 0.706 | 1.361 | 1.265 | 1.226 | 1.563 | 1.387 |
| Ant. 2 [10^(G/20)] value | 1.447 | 1.444 | 1.624 | 1.694 | 1.125 | 1.712 |
| Ant. 3 [10^(G/20)] value | 0.622 | 1.569 | 1.172 | 1.716 | 1.574 | 1.7 |
| Ant. 4 [10^(G/20)] value | 0.972 | 1.109 | 1.479 | 1.041 | 1.554 | 0.99 |
| Sum All Antenna [Amax] | 3.746 | 5.483 | 5.54 | 5.677 | 5.816 | 5.789 |
| DG [10*log(Amax^2/Nant)] | 5.45 | 8.76 | 8.85 | 9.06 | 9.27 | 9.23 |

Note:

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

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

6G Ant.

| Frequency (Hz) | 6.175G | 6.475G | 6.695G | 6.995G |
|--------------------------|--------------|---------------|---------------|---------------|
| Ant. 1 [10^(G/20)] | 10^(2.27/20) | 10^(-2.04/20) | 10^(-0.98/20) | 10^(4.81/20) |
| Ant. 2 [10^(G/20)] | 10^(0.13/20) | 10^(1.48/20) | 10^(2.74/20) | 10^(1.5/20) |
| Ant. 3 [10^(G/20)] | 10^(4.46/20) | 10^(3.47/20) | 10^(5.07/20) | 10^(-1.32/20) |
| Ant. 4 [10^(G/20)] | 10^(3.35/20) | 10^(4.41/20) | 10^(3.1/20) | 10^(2.99/20) |
| Ant. 1 [10^(G/20)] value | 1.299 | 0.791 | 0.893 | 1.74 |
| Ant. 2 [10^(G/20)] value | 1.015 | 1.186 | 1.371 | 1.189 |
| Ant. 3 [10^(G/20)] value | 1.671 | 1.491 | 1.793 | 0.859 |
| Ant. 4 [10^(G/20)] value | 1.471 | 1.661 | 1.429 | 1.411 |
| Sum All Antenna [Amax] | 5.455 | 5.129 | 5.486 | 5.198 |
| DG [10*log(Amax^2/Nant)] | 8.72 | 8.18 | 8.76 | 8.3 |

Note:

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

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



8. Summary of Test Result

2G5G Ant.

| Freq(Hz) | 2.45G | 5.2G | 5.3G | 5.6G | 5.785G | 5.885G |
|--|----------------------|--------------------|-------------------|--------------------|----------------------|--------------------|
| Ant. 1 Max Gain (dBi) | 2.09 | 3.8 | 3.29 | 4.33 | 3.96 | 4.25 |
| Ant. 2 Max Gain (dBi) | 3.21 | 4.66 | 5.01 | 5.49 | 5.28 | 5.78 |
| Ant. 3 Max Gain (dBi) | 2.14 | 4.51 | 5.64 | 5.94 | 5.78 | 5.87 |
| Ant. 4 Max Gain (dBi) | 2.42 | 4.08 | 3.89 | 5.43 | 5.25 | 5.66 |
| Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$ | Theta/ 75/240 | Theta/ 90/345 | Theta/ 90/22.5 | Theta/ 90/345 | Theta/ 90/345 | Theta/ 97.5/105 |
| Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$ | Theta/ 82.5/127.5 | Theta/ 90/225 | Theta/ 90/45 | Theta/ 90/225 | Theta/ 90/255 | Theta/ 90/255 |
| Ant. 3 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$ | Theta/ 75/60 | Theta/ 90/292.5 | Theta/ 105/165 | Theta/ 97.5/285 | Theta/ 90/300 | Theta/ 97.5/300 |
| Ant. 4 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$ | Theta/ 67.5/315 | Theta/ 97.5/195 | Theta/ 90/225 | Theta/ 90/217.5 | Theta/ 97.5/202.5 | Theta/ 97.5/60 |
| Max Gain (dBi) | 3.21 | 4.66 | 5.64 | 5.94 | 5.78 | 5.87 |
| DG [1SS] (dBi) | 5.45 | 8.76 | 8.85 | 9.06 | 9.27 | 9.23 |
| DG [2SS] (dBi) | 3.21 | 5.76 | 5.85 | 6.06 | 6.27 | 6.23 |
| DG [4SS] (dBi) | 3.21 | 4.66 | 5.64 | 5.94 | 5.78 | 5.87 |

Note:

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



6G Ant.

| Freq(Hz) | 6.175G | 6.475G | 6.695G | 6.995G |
|--|------------------|----------------|------------------|------------------|
| Ant. 1 Max Gain (dBi) | 4.44 | 4.67 | 4.72 | 5.69 |
| Ant. 2 Max Gain (dBi) | 5.23 | 4.75 | 5.27 | 4.4 |
| Ant. 3 Max Gain (dBi) | 4.46 | 4.71 | 5.87 | 5.89 |
| Ant. 4 Max Gain (dBi) | 5.3 | 4.53 | 5.86 | 5.8 |
| Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$ | Theta/90/52.5 | Theta/90/52.5 | Theta/82.5/22.5 | Theta/90/60 |
| Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$ | Theta/90/7.5 | Theta/90/322.5 | Theta/90/292.5 | Theta/90/292.5 |
| Ant. 3 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$ | Theta/90/352.5 | Theta/90/322.5 | Theta/82.5/247.5 | Theta/90/315 |
| Ant. 4 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$ | Theta/97.5/217.5 | Theta/90/217.5 | Theta/97.5/120 | Theta/97.5/112.5 |
| Max Gain (dBi) | 5.3 | 4.75 | 5.87 | 5.89 |
| DG [1SS] (dBi) | 8.72 | 8.18 | 8.76 | 8.3 |
| DG [2SS] (dBi) | 5.72 | 5.18 | 5.87 | 5.89 |
| DG [4SS] (dBi) | 5.3 | 4.75 | 5.87 | 5.89 |

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)



Scan Ant.

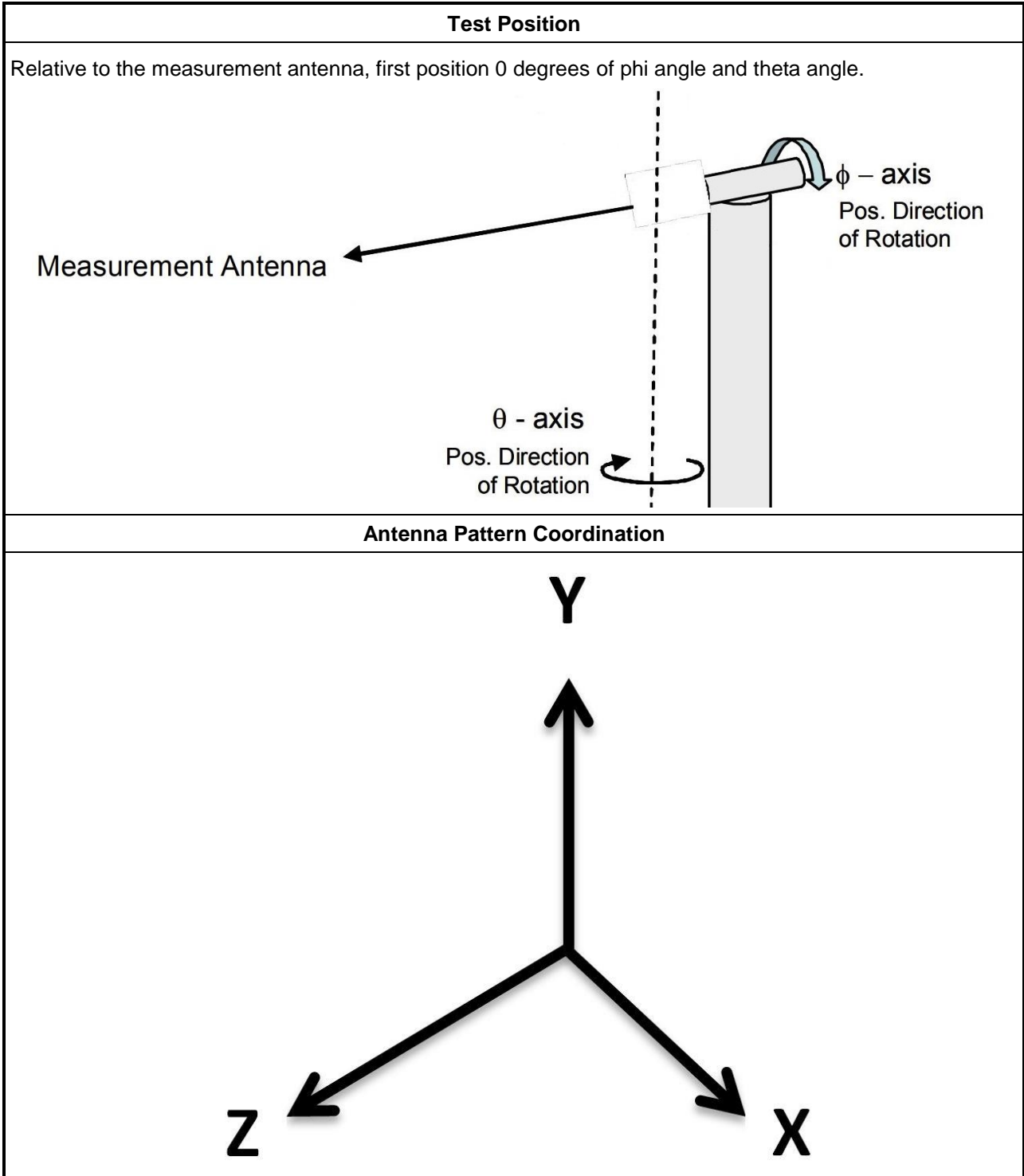
| Freq(Hz) | 2.45G | 5.2G | 5.3G | 5.6G | 5.785G | 5.885G |
|--|-----------------------|--------------------|--------------------|--------------------|---------------------|--------------------|
| Ant. 1 Max Gain (dBi) | 2.12 | 4.25 | 3.56 | 4.66 | 4.47 | 4.67 |
| Ant. 2 Max Gain (dBi) | 2.22 | 4.66 | 5.9 | 5.63 | 5.49 | 5.94 |
| Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$ | Theta/ 112.5/352.5 | Theta/ 97.5/300 | Theta/ 90/307.5 | Theta/ 97.5/30 | Theta/ 90/307.5 | Theta/ 90/262.5 |
| Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$ | Theta/ 75/30 | Theta/ 97.5/240 | Theta/ 97.5/225 | Theta/ 97.5/225 | Theta/ 105/232.5 | Theta/ 90/232.5 |
| Max Gain (dBi) | 2.22 | 4.66 | 5.9 | 5.63 | 5.49 | 5.94 |

| Freq(Hz) | 6.175G | 6.475G | 6.695G | 6.995G |
|--|------------------|----------------|-----------------|------------------|
| Ant. 1 Max Gain (dBi) | 5.88 | 5.3 | 5.29 | 4.25 |
| Ant. 2 Max Gain (dBi) | 5.81 | 5.83 | 5.9 | 4.79 |
| Ant. 1 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$ | Theta/97.5/60 | Theta/90/337.5 | Theta/97.5/37.5 | Theta/90/292.5 |
| Ant. 2 Polarization/ $\Theta(^{\circ})/\Phi(^{\circ})$ | Theta/97.5/232.5 | Theta/90/285 | Theta/105/135 | Theta/97.5/232.5 |
| Max Gain (dBi) | 5.88 | 5.83 | 5.9 | 4.79 |

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 2G5G5.9G.....Page 17

Appendix B – Radiated Composite Gain of 6G.....Page 33

Appendix C – Radiated Composite Gain of scan.....Page 44

Appendix D – Antenna Pattern of 2G5G5.9G.....Page 55

Appendix E – Antenna Pattern of 6G..... Page 63

Appendix F – Antenna Pattern of scan..... Page 69

Appendix G – Test Photos..... Page 76

————THE END————



Radiated Composite Gain Data of 2.4GHz&5GHz&5.9GHz

Appendix A

| Freq(Hz) | 2.45G | 5.2G | 5.3G | 5.6G | 5.785G | 5.885G |
|--|------------------|----------------|---------------|----------------|------------------|----------------|
| Ant. 1 Max Gain (dBi) | 2.09 | 3.8 | 3.29 | 4.33 | 3.96 | 4.25 |
| Ant. 2 Max Gain (dBi) | 3.21 | 4.66 | 5.01 | 5.49 | 5.28 | 5.78 |
| Ant. 3 Max Gain (dBi) | 2.14 | 4.51 | 5.64 | 5.94 | 5.78 | 5.87 |
| Ant. 4 Max Gain (dBi) | 2.42 | 4.08 | 3.89 | 5.43 | 5.25 | 5.66 |
| Ant. 1 Polarization/ $\theta(^{\circ})/\phi(^{\circ})$ | Theta/75/240 | Theta/90/345 | Theta/90/22.5 | Theta/90/345 | Theta/90/345 | Theta/97.5/105 |
| Ant. 2 Polarization/ $\theta(^{\circ})/\phi(^{\circ})$ | Theta/82.5/127.5 | Theta/90/225 | Theta/90/45 | Theta/90/225 | Theta/90/255 | Theta/90/255 |
| Ant. 3 Polarization/ $\theta(^{\circ})/\phi(^{\circ})$ | Theta/75/60 | Theta/90/292.5 | Theta/105/165 | Theta/97.5/285 | Theta/90/300 | Theta/97.5/300 |
| Ant. 4 Polarization/ $\theta(^{\circ})/\phi(^{\circ})$ | Theta/67.5/315 | Theta/97.5/195 | Theta/90/225 | Theta/90/217.5 | Theta/97.5/202.5 | Theta/97.5/60 |
| Max Gain (dBi) | 3.21 | 4.66 | 5.64 | 5.94 | 5.78 | 5.87 |
| DG [1SS] (dBi) | 5.45 | 8.76 | 8.85 | 9.06 | 9.27 | 9.23 |
| DG [2SS] (dBi) | 3.21 | 5.76 | 5.85 | 6.06 | 6.27 | 6.23 |
| DG [4SS] (dBi) | 3.21 | 4.66 | 5.64 | 5.94 | 5.78 | 5.87 |



Radiated Composite Gain Data of 2.4GHz&5GHz&5.9GHz

Appendix A

Table with 36 columns and 100 rows of gain data for various frequencies and directions.



Radiated Composite Gain Data of 2.4GHz&5GHz&5.9GHz

Appendix A

| Freq(Hz) | Theta/Pol | 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°) | -19.07/-19.1 | -17.83/-15.22 | -15.52/-12.43 | -11.59/-11.18 | -12.37/-13.32 | -14.36/-15.83 | -17.12/-19.31 | -19.01/-17.54 | -17.71/-17.53 | -16.23/-16.66 | -15.33/-15.63 | -15.17/-13.14 | -12.85/-11.86 | -11.34/-11.94 | -12.94/-14.37 | -17.23/-18.7 | -18.98/-18.84 | -18.86/-18.72 | -15.8/-16.09 | -15.92/-13.4 | -13.67/-14.77 | -17.82/-15.68 | -13.62/-16.54 | -18.26/-16.05 | |
| Theta(7.5°) | -15.49/-15.31 | -15.13/-14.17 | -14.46/-15.9 | -16.45/-16.53 | -15.67/-15.75 | -15.79/-14.68 | -14.19/-15.52 | -16.71/-14.63 | -12.18/-12.23 | -13.21/-11.39 | -11.33/-13.56 | -12.3/-12.54 | -13.72/-13.88 | -12.83/-13.23 | -16.16/-16.7 | -18.61/-19.23 | -19.14/-18.34 | -16.28/-16.57 | -16.98/-16.5 | -14.32/-13.46 | -14.37/-15.5 | -14.49/-12.95 | -14.21/-15.22 | -15.93/-15.87 | |
| Theta(15°) | -18.86/-18.42 | -14.84/-14.33 | -18.24/-17.13 | -16.51/-17.96 | -17.96/-18.98 | -17.81/-15.76 | -13.19/-13.92 | -13.41/-13.16 | -10.94/-9.35 | -9.03/-10.47 | -10.56/-9.25 | -9.18/9 | -9.12/-9.43 | -10.74/-10.33 | -13.56/-12.08 | -9.37/-8.4 | -9.41/-10.37 | -14.3/-18.58 | -17.99/-15.54 | -13.71/-12.02 | -11.38/-12.37 | -16.18/-13.27 | -15.32/-15.32 | -18.17/-18.5 | |
| Theta(22.5°) | -18.33/-18.28 | -15.67/-12 | -13.61/-14.18 | -11.06/-11.67 | -15.65/-17.96 | -16.2/-12.83 | -12.81/-13.5 | -13.86/-14.19 | -13.33/-14.91 | -18.25/-16.61 | -13.39/-12.7 | -12.01/-12.51 | -12.55/-11.01 | -9.46/-8.99 | -8.44/-6.89 | -7.79/-12.73 | -18.37/-13.04 | -11.76/-11.48 | -13.82/-16.09 | -19.12/-17.05 | -13.33/-13.04 | -14.16/-13.05 | -15.08/-19.05 | | |
| Theta(30°) | -17.05/-19.15 | -17.14/-17.45 | -9.84/-9.7 | -10.54/-13.72 | -15.74/-11.09 | -11.15/-9.01 | -7.18/-7.35 | -9.73/-11.17 | -9.8/-9.1 | -7.63/-7.96 | -10.44/-8.29 | -9.03/-10.41 | -7.41/-7.92 | -8.08/-7.06 | -6.39/-6.99 | -9.74/-7.08 | -5.8/-9.43 | -9.47/-8.78 | -11.07/-10.8 | -10.35/-10.04 | -10.1/-8.99 | -9.33/-9.09 | -8.22/-11.81 | -11.16/-10.52 | |
| Theta(37.5°) | -9.88/-9.3 | -9.87/-13.41 | -11.83/-8.32 | -13.48/-12.56 | -8.86/-8.24 | -10.36/-5.48 | -4.49/-4.52 | -7.27/-5.29 | -5.71/-9.09 | -12.89/-9.55 | -4.49/-3.36 | -4.07/-2.92 | -2.3/-3.11 | -3.43/-5.52 | -6.4/-7.1 | -8.69/-7.72 | -4.88/-6.42 | -8.21/-7.88 | -7.88/-11.62 | -8.29/-7.62 | -8.09/-13.32 | -14.29/-12.87 | -19.06/-17.03 | | |
| Theta(45°) | -10.64/-7.05 | -6.73/-8.72 | -11.91/-5.9 | -13.44/-14.4 | -8.34/-9.34 | -5.73/-6.07 | -7.57/-8.2 | -10.61/-9.96 | -7.04/-3.4 | -3.06/-4.82 | -8.23/-8.81 | -7.96/-9.04 | -9.32/-5.58 | -3.05/-4.57 | -8.53/-7.05 | -4.61/-5.21 | -6.26/-5.27 | -7.13/-5.32 | -7.06/-12.48 | -6.63/-7.76 | -12.84/-9.15 | -7.27/-8.51 | -10.5/-7.89 | -7.42/-15.48 | |
| Theta(52.5°) | -6.93/-9.6 | -8.25/-10.53 | -11.9/-5.98 | -11.52/-10.99 | -5.92/-7.2 | -5.98/-10.05 | -9.46/-9.48 | -10.09/-8.22 | -11.05/-14.74 | -12.82/-11.23 | -8.72/-8.68 | -18.8/-9.56 | -5.46/-12.05 | -13.75/-8.99 | -9.09/-8.78 | -8.41/-6.98 | -5.18/-3.34 | -5.37/-3.98 | -9.65/-9.66 | -9.52/-11.8 | -9.68/-6.38 | -5.56/-6.02 | -4.86/-6.72 | -6.86/-12.28 | |
| Theta(60°) | -8.71/-11.53 | -9.82/-12.28 | -11.58/-8.78 | -12.86/-18.6 | -12.02/-10.71 | -13.31/-16.31 | -13.02/-6.29 | -8.74/-6.24 | -11.39/-17.93 | -8.27/-9.55 | -7.96/-12.13 | -11.03/-9.72 | -10.87/-14.17 | -4.57/-6.5 | -10.67/-7.93 | -15.01/-9.15 | -8.41/-7.52 | -9.77/-6.52 | -7.86/-8.69 | -10.6/-15.14 | -9.74/-6.1 | -6.17/-3 | -7.52/-6.47 | -5.84/-13.57 | |
| Theta(67.5°) | -7.93/-6.67 | -8.94/-11.12 | -7.39/-3.9 | -7.05/-6.9 | -8.83/-12.75 | -11.91/-4.7 | -0.01/-5.6 | 0.01/-0.1 | -1.29/-4.4 | -1.38/-2.2 | -0.96/-1.24 | -0.51/-4.29 | -4.8/-3.31 | -4.07/-5.5 | -5.28/-5.1 | -3.27/-11.1 | -9.14/-9.37 | -8.28/-8.71 | -4.38/-11.94 | -6.27/-3.58 | -3.23/-5.97 | -6.3/-5.6 | -5.66/-6.14 | | |
| Theta(75°) | -2.76/-2.41 | -2.42/-4.29 | -0.18/-0.76 | 0.29/-5.14 | -2.83/-3.02 | -1.88/-6.67 | -5.48/-8.56 | -5.82/-2.99 | -6.11/-3.46 | -0.95/-1.58 | 0.45/-2.64 | -2.66/-4.95 | -6.78/-2.88 | -2.08/-3.57 | -4.58/-3.97 | -4.11/-5.06 | -1.93/-4.32 | -3.01/-1.82 | -6.03/-5.5 | -2.94/-2.64 | -4.33/-2.94 | -3.37/-3.03 | -3.1/-2.6 | -3.49/-1.85 | |
| Theta(82.5°) | 0.54/-1.89 | 1.16/-1.66 | 1.96/-2.06 | 3.45/-3.6 | -1.06/-5.06 | -6.1/-5.78 | -6.04/-4.7 | -4.25/-6.66 | -4.55/-1.61 | -6.11/-1.32 | 0.51/-8.49 | -4.28/-13.6 | -11.77/-3.1 | -5.12/-2.12 | -1.38/-0.07 | 2.07/-1.5 | 1.56/-2.05 | 2.24/-1.94 | 0.18/-2.58 | -0.96/-0.5 | -1.63/-3.12 | -1.93/-5.05 | -1.38/-0.93 | 0.32/-0.86 | |
| Theta(90°) | 2.94/-3.5 | 3.483/-4.6 | 4.164/-2.6 | 5.01/-2.22 | 5.54/-0.25 | -2.60/-2.7 | 1.47/-0.01 | -1.43/-2.75 | 2.02/-1.6 | 2.05/-6.76 | -1.71/-1.78 | -1.63/-7.59 | -0.77/-1.54 | -1.15/-2.71 | 1.052/-3.1 | 3.78/-0.34 | 2.414/-0.5 | 4.224/-2.9 | 2.86/-1.62 | 0.652/0.6 | 1.96/-0.78 | 2.069/-1 | -1.80/-2.3 | 2.22/-4.6 | |
| Theta(97.5°) | 3.474/-0.5 | 3.843/-7 | 4.214/-8.3 | 4.664/-0.5 | 1.58/-0.61 | -2.96/-0.54 | -0.13/-0.14 | 0.63/-3.47 | 0.01/-4.02 | 0.21/-3.53 | 1.64/-0.5 | -2.69/-2.6 | 1.95/-2.55 | 2.76/-2.1 | 1.314/-4.6 | 3.583/-6.2 | 3.38/-0.94 | 0.872/-7.1 | 3.331/-1.6 | 0.060/-4.5 | -2.26/-0.39 | 2.32/-2.7 | | | |
| Theta(105°) | 1.531/-9.6 | 3.043/-5.4 | 3.113/-5 | 3.684/-0.4 | 0.94/-2.6 | -4.92/-1.71 | 0.78/-1.06 | -4.14/-4.74 | -4.28/-2.33 | 0.940/-5.1 | 0.91/-5.25 | -0.57/-8.4 | 0.44/-3.27 | -6.04/-7.64 | -2.05/-3.1 | -1.042/-5.8 | 0.2/-2.57 | -1.05/-7.07 | 0.71/-2.55 | -1.010/-11 | -1.98/-2.44 | -0.79/-1.1 | | | |
| Theta(112.5°) | 0.07/-2.11 | 0.710/-4 | 0.96/-0.03 | 1.48/-0.21 | -1.65/-0.01 | -8.23/-11.26 | -2.4/-5.66 | -4.25/-2.08 | -9/-4.73 | -2.58/-2.15 | -6.69/-5.18 | -6.58/-15.84 | -5.18/-7.7 | -11.06/-10.79 | -7.8/-5.86 | -5.2/-18.08 | -6.63/-1.59 | -4.03/-2.06 | -3.46/-7.57 | -6.14/-5.09 | -3.6/-7 | -5.56/-5.11 | -5.91/-7.39 | -4.67/-2.84 | |
| Theta(120°) | -5.29/-8.21 | -6.71/-6.44 | -3.71/-8.1 | -3.87/-4.23 | -5.53/-6.13 | -7.72/-14.93 | -10.93/-11.65 | -9.46/-18.27 | -7.92/-8.29 | -5.36/-8.82 | -19.72/-13.21 | -18.83/-17.22 | -15.07/-13.41 | -18.61/-12.85 | -9.44/-8.43 | -9.71/-18.38 | -6.07/-10.1 | -8.61/-11.56 | -11.92/-9.17 | -18.65/-12.07 | -10.13/-10.84 | -10.21/-10.02 | -14.93/-16.63 | -8.81/-7.3 | |
| Theta(127.5°) | -17.66/-17.93 | -19.13/-19.15 | -18.35/-14.24 | -13.49/-12.76 | -11.58/-11.38 | -5.68/-15.9 | -3.66/-2.89 | -2.41/-5.54 | -1.83/-3.54 | -8.16/-8.01 | -8.36/-9.95 | -8.8/-8.3 | -14.44/-14.2 | -10.51/-10.82 | -16.29/-16.61 | -16.93/-11.09 | -13.23/-15.9 | -18.64/-17.07 | -12.63/-16.64 | -16.83/-18.26 | -19.25/-19.26 | -12.92/-13.31 | -13.96/-14.9 | -16.63/-16.13 | |
| Theta(135°) | -17.58/-8.99 | -9.11/-9.85 | -14.66/-14.24 | -11.17/-18.69 | -12.35/-15.91 | -11.33/-15.91 | -7.95/-6.49 | -5.87/-9.43 | -5.35/-7.7 | -13.21/-12.1 | -6.48/-4.61 | -5.54/-7.21 | -9.24/-10.75 | -18.31/-14.96 | -18.72/-13.96 | -8.98/-6.5 | -12.17/-8.6 | -9.58/-8.45 | -6.5/-6.44 | -10.55/-18.89 | -12.81/-12.96 | -11.29/-7.72 | -11.98/-10.68 | -6.85/-10.2 | |
| Theta(142.5°) | -11.25/-9.28 | -8.07/-9.08 | -11.97/-9.24 | -11.96/-12.38 | -8.48/-8.22 | -12.39/-13.59 | -15.41/-14.15 | -10.04/-6.2 | -7.05/-5.07 | -6.31/-10.02 | -11.72/-18.56 | -16.69/-11.95 | -16.03/-19.08 | -16.69/-13.26 | -18.28/-16.95 | -13.24/-19.98 | -9.66/-8.78 | -9.93/-7.7 | -13.69/-15.53 | -13.73/-13.39 | -6.7/-7.02 | -9.46/-7.71 | -7.27/-6.97 | | |
| Theta(150°) | -7.68/-8.88 | -8/-7.11 | -7.62/-10.94 | -10.08/-13.8 | -12.46/-9 | -7.36/-7.88 | -8.06/-9.48 | -8.21/-9.64 | -16.86/-6.46 | -7.31/-9.37 | -12.92/-11.97 | -18.64/-16.32 | -11.34/-12.04 | -9.41/-10.53 | -10.21/-8.36 | -12.45/-14.35 | -14.64/-11.92 | -10.71/-18.21 | -10.53/-10.16 | -13/-13.66 | -9.38/-9.71 | -8.86/-6.75 | -7.51/-8.8 | -8.54/-12 | |
| Theta(157.5°) | -7.45/-9.49 | -11.62/-11.14 | -11.59/-9.83 | -8.48/-7.9 | -8.1/-8.07 | -8.62/-11.13 | -16.56/-19.27 | -15.13/-15.72 | -18.03/-16.99 | -15.48/-14.77 | -9.87/-18.9 | -17.92/-10.24 | -8.58/-11.93 | -14.42/-13.96 | -17.68/-18.2 | -17.95/-15.53 | -18.8/-18.44 | -15.56/-14.54 | -15.58/-18.88 | -16.77/-11.18 | -9.79/-8.86 | -6.95/-6.48 | -7.53/-7.25 | | |
| Theta(165°) | -10.84/-9.77 | -8.77/-9.84 | -9.99/-10.1 | -12.21/-14.42 | -12.42/-9.9 | -8.62/-7.91 | -6.66/-6.77 | -8.29/-10.26 | -12.41/-11.23 | -10.57/-15.57 | -18.48/-10.58 | -17.68/-15.22 | -16.09/-14.45 | -12.34/-11.71 | -11.37/-11.11 | -14.53/-19.06 | -14.79/-15.55 | -19.19/-18.13 | -18.71/-18.28 | -15.33/-13.56 | -15.04/-14.08 | -13.49/-14.75 | -10.93/-11.8 | | |
| Theta(172.5°) | -18.02/-18.04 | -18.73/-18.82 | -13.36/-17.75 | -11.32/-11.47 | -11.55/-11.4 | -11.64/-13.95 | -15.02/-15.2 | -16.47/-17.78 | -17.85/-17.6 | -15.16/-14.58 | -15.44/-14.52 | -14.86/-14.52 | -13.42/-13.87 | -15.51/-15.24 | -13.72/-14.19 | -14.65/-13.25 | -14.77/-16.26 | -17.31/-17.7 | -18.71/-18.83 | -18.54/-18.62 | -18.07/-18.11 | -18.75/-17.23 | -19.19/-18.86 | -19.27/-18.53 | |
| Theta(180°) | -18.38/-17.24 | -14.87/-14.03 | -15.51/-18.95 | -16.46/-13.06 | -11.25/-10.76 | -10.64/-10.53 | -10.37/-11.17 | -13.07/-18.85 | -18.9/-14.9 | -14.88/-16.77 | -12.95/-13.36 | -17.99/-16.67 | -17.73/-17.9 | -17.83/-18.23 | -18.9/-17.99 | -17.25/-17.03 | -18.72/-18.21 | -19.46/-18.21 | -18.68/-18.54 | -18.53/-18.62 | -18.13/-17.6 | -19.04/-17.75 | -18.18/-18.04 | | |
| 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(0°) | -12.99/-17.25 | -13.74/-12.03 | -12.11/-12.67 | -11.53/-11.92 | -13.39/-15.78 | -15.92/-14.61 | -16.42/-18.73 | -16.51/-16.14 | -19.01/-16.81 | -14.85/-18.03 | -16.06/-16.52 | -15.94/-12.93 | -16.35/-17.46 | -14.27/-11.86 | -10.88/-11.05 | -12.96/-13.46 | -11.63/-13.35 | -12.75/-13.83 | -13.11/-15.52 | -17.17/-11.8 | -18.64/-18.82 | -18.27/-18.31 | -19.14/-17.02 | -18.88/-14.31 | |
| Theta(7.5°) | -13.88/-18.28 | -17.97/-12.31 | -11.52/-15.87 | -16.4/-12.15 | -11.47/-11.84 | -11.11/-10.79 | -11.87/-14.43 | -14.63/-15.28 | -17.05/-18.32 | -18.57/-17.6 | -19.09/-18.6 | -18.06/-16.45 | -18.31/-17.6 | -14.64/-13.87 | -14.09/-14.88 | -13.85/-13.1 | -12.51/-13.67 | -13.51/-18.64 | -15.71/-18.84 | -18.56/-17.35 | -15.11/-14.4 | -12.68/-17.31 | -15.69/-12.21 | -17.69/-18.1 | |
| Theta(15°) | -18.12/-17.87 | -16.89/-18.23 | -19.17/-17.13 | -18.63/-17.98 | -16.38/-16.47 | -14.86/-17.53 | -18.02/-17.24 | -13.04/-15.16 | -19.02/-19.19 | -18.63/-15.26 | -15.14/-18.5 | -18.01/-18.26 | -13.96/-12.21 | -13.03/-12.07 | -12.41/-16.55 | -16.44/-15.29 | -16.44/-16.11 | -17.31/-18.44 | -17.64/-17.8 | -18.39/-17.42 | -18.98/-17.77 | -18.92/-19.13 | -15.09/-16.76 | | |
| Theta(22.5°) | -14.75/-18.68 | -18.27/-15.82 | -18.52/-19.09 | -18.98/-16.39 | -16.27/-18.78 | -18.02/-18.44 | -18.26/-17.72 | -19.16/-18.76 | -10.56/-9.4 | -14.89/-15.72 | -17.68/-18.15 | -12.54/-11.73 | -13 | | | | | | | | | | | | |



Radiated Composite Gain Data of 2.4GHz&5GHz&5.9GHz

Appendix A

| Theta | Phi | Gain | Phi(7.5) | Phi(15) | Phi(30) | Phi(45) | Phi(60) | Phi(75) | Phi(90) | Phi(105) | Phi(120) | Phi(135) | Phi(150) | Phi(165) | Phi(180) | Phi(195) | Phi(210) | Phi(225) | Phi(240) | Phi(255) | Phi(270) | Phi(285) | Phi(300) | Phi(315) | Phi(330) | Phi(345) | | | | |
|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------|--|--|--|--|
| Theta(120°) | -9.71-9.07 | -18.09-6.92 | -17.68-7.47 | -8.1-8.78 | -8.66-7.43 | -17.99-9.01 | -7.54-6.03 | -12.15-2.19 | -5.23-4.56 | 1.65/1.05 | 1.03/1.03 | 3.25-0.62 | -1.90-44 | 1.19-0.44 | -0.05-5.28 | -1.56-0.73 | -0.06-0.36 | 0.08-0.39 | -0.78-1.38 | -1.01/1.14 | -0.44-6.65 | -2.22/1.94 | -4.1-10.36 | -15.12-11.66 | | | | | | |
| Theta(125°) | -15.29-7.68 | -7.59-8.82 | -7.3-6.12 | -5.4-1.16 | -5.81-9.04 | -6.66-17.09 | -9.29-11.45 | -17.83-6.04 | -12.21-8.37 | -4.47-5.2 | -2.59-1.97 | -1.05-5.22 | -2.33-44 | -1.86-3.76 | -11.18-9.28 | -1.67-0.73 | -6.66-6.66 | -5.76-5.97 | -3.5-4.38 | -4.59-3.67 | -5.49-1.72 | -18.51-7.35 | -16.45-17.86 | -6.91-8.99 | | | | | | |
| Theta(130°) | -12.55-5.44 | -5.98-6.2 | -8.42-19 | -10.05-8.21 | -14.34-6.73 | -4.58-8.66 | -6.93-18.89 | -17.82-12.97 | -19.39-19.14 | -12.51-10.72 | -12.72-13.64 | -13.51-14.69 | -14.69-11.51 | -9.18-13.64 | -11.69-9.16 | -8.3-7.5 | -12.48-18.66 | -14.99-16.52 | -14.12-10.69 | -7.98-17.79 | -6.95-9.17 | -5.67-11.02 | -14.57-12.19 | -14.57-12.19 | -12.88-13.34 | | | | | |
| Theta(135°) | -11.46-11.56 | -15.37-18.28 | -10.03-7.79 | -5.68-7.27 | -11.22-13.6 | -13.26-13.61 | -11.97-19.33 | -14.51-18.44 | -11.02-16.15 | -16.64-18.23 | -14.87-13.99 | -10.74-15.37 | -15.19-18.4 | -16.15-19.11 | -19.01-15.47 | -17.65-18.48 | -18.56-17.26 | -13.02-10.59 | -10.87-12.39 | -8.86-7.82 | -16.15-18.88 | -9.06-4.78 | -6.08-7.59 | -8.52-18.28 | | | | | | |
| Theta(140°) | -9.99-10.72 | -13.28-12.74 | -11.06-5.67 | -8.48-11.1 | -9.28-7.73 | -9.51-14.37 | -13.61-8.4 | -9.04-11.28 | -13.91-18.38 | -12.67-11.52 | -8.36-18.6 | -12.43-12.17 | -10.2-9.66 | -8.99-14.13 | -11.75-6.87 | -11.71-13.5 | -19.33-18.07 | -12.29-5.57 | -7.34-7.08 | -6.33-6.58 | -13.21-16.54 | -14.18-5.46 | -4.03-6.27 | -7.83-9.55 | | | | | | |
| Theta(145°) | -15.41-17.05 | -9.31-8.99 | -14.31-17.7 | -12.21-12.36 | -10.43-12.4 | -14.19-3.7 | -7.61-7.89 | -12.91-11.28 | -8.26-11.25 | -12.33-17.82 | -13.48-10.51 | -10.59-13.6 | -10.88-9.93 | -12.31-9.09 | -7.58-7.47 | -6.33-7.19 | -14.28-11.19 | -5.84-6.43 | -12.27-8.85 | -8.9-10.83 | -12.71-15.58 | -16.59-16.56 | -7.71-8.97 | -13.29-13.15 | | | | | | |
| Theta(150°) | -14.66-19.03 | -15.78-17.99 | -14.2-10.78 | -14.87-17.89 | -13.38-8.69 | -7.27-8.94 | -12.52-9.28 | -7.62-7.59 | -9.8-14.11 | -15.68-13.27 | -9.78-10.81 | -15.79-17.16 | -17.56-14.87 | -10.39-8.64 | -6.69-6.38 | -8.28-7.11 | -9.95-10.12 | -9.91-13.82 | -7.58-6.82 | -11.57-17.63 | -17.03-18 | -17.16-12.56 | -11.57-12.59 | -12.52-13.98 | | | | | | |
| Theta(155°) | -18.76-15.75 | -17.61-16.56 | -14.67-16.4 | -17.77-19.02 | -13.91-11.67 | -12.66-16.25 | -18.22-13.55 | -11.71-10.4 | -10.11-10.16 | -10.94-12.16 | -12.65-14.3 | -17.63-16.68 | -11.51-10.81 | -11.85-11.11 | -10.41-11.41 | -9.37-11.64 | -8.85-8.34 | -11.37-14.43 | -15.35-15.14 | -13.83-12.94 | -13.16-13.4 | -13.92-11.96 | -12.13-12.39 | -12.77-13.1 | | | | | | |
| Theta(160°) | -18.05-17.81 | -18.13-18.96 | -16.43-14.04 | -13.17-12.61 | -11.79-14.05 | -16.89-16.01 | -14.48-12.26 | -10.8-9.67 | -9.99-11.13 | -12.56-10.61 | -18.98-17.85 | -17.86-19.12 | -18.9-18.13 | -19.03-19.39 | -17.79-18.59 | -14.56-13.29 | -18.44-13.48 | -11.05-9.61 | -9.17-10.74 | -12.39-16.53 | -19.11-18.15 | -17.24-17.39 | -17.87-17.92 | | | | | | | |
| Theta(165°) | -13.18-13.86 | -18.62-17.24 | -19.18-18.69 | -18.28-19.08 | -17.47-18.29 | -18.49-19.15 | -18.17-18.74 | -18.16-18.31 | -17.21-16.82 | -18.04-14.98 | -14.45-17.53 | -18.61-17.85 | -17.33-18.75 | -18.62-17.99 | -17.81-19.01 | -17.09-14.94 | -12.19-10.46 | -10.11-11.9 | -15.86-18.09 | -19.15-18.05 | -18.41-17.98 | -17.91-18.16 | -17.81-13.95 | -11.24-12.35 | | | | | | |
| Gain | Phi(7.5) | Phi(15) | Phi(30) | Phi(45) | Phi(60) | Phi(75) | Phi(90) | Phi(105) | Phi(120) | Phi(135) | Phi(150) | Phi(165) | Phi(180) | Phi(195) | Phi(210) | Phi(225) | Phi(240) | Phi(255) | Phi(270) | Phi(285) | Phi(300) | Phi(315) | Phi(330) | Phi(345) | | | | | | |
| Theta(0°) | -17.76-12.65 | -14.78-19.14 | -16.39-17.9 | -18.83-17.67 | -18.29-18.96 | -18.27-18.21 | -18.31-19.15 | -18.97-18.73 | -18.28-17.75 | -18.37-19.14 | -18.77-17.42 | -18.55-18.51 | -19.11-17.87 | -19.07-18.89 | -17.71-16.03 | -18.21-15.85 | -14.21-17.69 | -17.12-18.85 | -18.01-18.27 | -16.05-16.47 | -17.19-17.81 | -17.81-14.97 | -13.07-16.12 | -15.75-12.55 | | | | | | |
| Theta(5°) | -18.37-18.57 | -17.88-17.47 | -14.52-15.37 | -18.92-15.18 | -16.22-15.62 | -16.04-17 | -18.88-18.42 | -18.99-18.64 | -17.73-18.81 | -17.73-14.68 | -16.03-18.59 | -14.41-12.28 | -16.77-17.38 | -14.17-18.59 | -18.29-17.62 | -18.19-17.74 | -17.68-17.97 | -15.45-16.87 | -19.38-17.6 | -18.24-18.05 | -17.31-18.57 | -17.97-18.47 | -17.07-18.71 | | | | | | | |
| Theta(10°) | -18.96-18.43 | -18.89-14.5 | -13.31-16.69 | -12.81-17.34 | -17.35-16.33 | -13.22-13.87 | -15.72-15.72 | -14.85-16.2 | -19.35-18.21 | -18.14-18.09 | -18.31-18.21 | -16.71-13.35 | -12.39-13.13 | -16.87-16.79 | -18.81-18.9 | -18.23-18.31 | -17.58-18.61 | -18.71-18.56 | -14.95-14.69 | -18.71-18.56 | -15.99-16.28 | -18.34-17.82 | -18.17-14.89 | -14.44-18.54 | -18.13-18.37 | | | | | |
| Theta(15°) | -19.09-8.19 | -8.84-8.24 | -9.33-19.06 | -17.56-17.57 | -17.94-18.61 | -14.55-13.46 | -15.71-16.83 | -14.76-11.91 | -10.22-11.02 | -12.91-15.53 | -17.94-18.54 | -12.99-12.41 | -13.78-13.32 | -18.78-18.78 | -16.84-16.73 | -18.51-16.4 | -18.62-18.74 | -18.51-17.94 | -18.42-17.14 | -15.21-14.63 | -14.29-13.6 | -17.07-18.37 | -18.55-17.13 | -13.81-18.75 | | | | | | |
| Theta(20°) | -9.41-12.61 | -14.32-18.52 | -17.69-14.63 | -14.07-18.53 | -18.02-14.14 | -17.17-12.4 | -18.15-46 | -18.17-16.76 | -13.43-12.58 | -15.36-16.69 | -17.48-18.39 | -15.12-10.67 | -12.16-16.9 | -17.14-16.1 | -18.15-14.6 | -17.63-19.09 | -15.27-18.01 | -18.91-14.5 | -15.18-17.13 | -19.34-15.53 | -17.66-16.22 | -12.04-14.15 | -17.82-17.45 | -18.02-17.75 | | | | | | |
| Theta(25°) | -13.12-16.19 | -16.11-16.31 | -19.16-11.31 | -17.10-17.72 | -12.51-11.78 | -16.11-18.54 | -18.68-15 | -17.31-15.14 | -13.11-12.74 | -15.36-15.79 | -17.31-18.66 | -11.29-9.63 | -13.69-18.95 | -14.44-18.16 | -16.67-18.8 | -16.78-18.1 | -18.19-18.46 | -17.69-17.59 | -15.13-14.51 | -18.36-17.96 | -15.29-13.8 | -19.11-18.26 | -19.33-10.59 | | | | | | | |
| Theta(30°) | -15.98-17.63 | -11.03-18.91 | -14.06-9.91 | -9.52-19.41 | -18.63-12.12 | -12.97-17.41 | -17.48-17.7 | -12.95-18.54 | -17.88-17.62 | -13.36-11.75 | -15.08-17.98 | -15.65-17.15 | -16.38-18.87 | -15.58-18.18 | -10.66-13.12 | -18.86-18.06 | -17.71-17.51 | -15.72-17.23 | -15.05-17.94 | -12.31-19.21 | -17.99-17.85 | -15.97-11.57 | -17.92-17.88 | -15.74-18.28 | | | | | | |
| Theta(35°) | -12.05-18.99 | -10.02-15.27 | -12.92-10.88 | -17.86-16.1 | -12.08-12.95 | -17.31-19.55 | -15.75-16.76 | -18.92-14.85 | -10.92-10.21 | -14.81-13.13 | -13.08-19.05 | -14.72-14.04 | -18.35-18.36 | -15.64-14.54 | -13.81-19.1 | -17.48-18.41 | -18.71-18.98 | -15.66-17.1 | -17.18-18 | -14.94-17.82 | -19.27-14.17 | -17.56-17.64 | -14.94-17.93 | -13.43-18.73 | | | | | | |
| Theta(40°) | -11.74-16.32 | -18.03-14.23 | -9.20-15.99 | -16.31-15.73 | -11.98-10.27 | -18.49-9.97 | -17.01-18.47 | -18.95-18.51 | -18.11-13.94 | -14.18-16.86 | -17.19-18.34 | -17.94-10.32 | -17.06-18.15 | -14.42-14.95 | -17.55-15.25 | -14.21-19.19 | -17.91-13.97 | -12.12-13.2 | -17.71-19.12 | -18.71-18.22 | -18.47-17.94 | -17.61-17.72 | -18.53-18.97 | -17.91-18.56 | | | | | | |
| Theta(45°) | -11.26-14.3 | -13.68-8.16 | -8.69-9.81 | -16.37-10.56 | -8.78-8.33 | -17.64-13.21 | -17.63-19.54 | -14.16-18.88 | -18.37-15.65 | -12.37-18.42 | -18.27-14.2 | -15.91-16.49 | -19.06-18.26 | -18.51-18.7 | -18.23-18.68 | -17.25-17.46 | -17.78-17.82 | -14.45-17.86 | -18.44-18.17 | -17.64-18.77 | -19.16-19.4 | -18.11-19.03 | -17.47-14.86 | -18.21-18.68 | | | | | | |
| Theta(50°) | -18.45-18.07 | -13.66-7.15 | -11.37-14.54 | -16.33-16.45 | -12.58-11.47 | -17.91-13.05 | -10.86-13.73 | -13.58-19 | -15.98-14.61 | -13.58-19 | -15.98-14.61 | -16.18-18.78 | -15.61-18.34 | -18.95-18.02 | -18.87-19.05 | -17.75-13.54 | -18.86-19.05 | -16.36-18.66 | -19.01-17.91 | -15.68-15.68 | -18.41-17.19 | -14.73-17.95 | -17.12-17.95 | -16.47-19.24 | | | | | | |
| Theta(55°) | -18.83-19.02 | -18.76-9.45 | -14.65-14.78 | -19.19-14.56 | -18.35-13.67 | -11.29-18.76 | -18.17-18.21 | -14.66-16.66 | -12.96-15.97 | -18.38-12.25 | -17.42-12.12 | -10.31-17.49 | -15.69-14.6 | -18.88-19.2 | -18.68-19 | -18.29-14.17 | -18.29-14.17 | -18.29-14.17 | -18.29-14.17 | -18.29-14.17 | -18.29-14.17 | -18.29-14.17 | -18.29-14.17 | -18.29-14.17 | -18.29-14.17 | | | | | |
| Theta(60°) | -17.55-17.99 | -18.14-12.58 | -17.76-17.8 | -18.56-11.99 | -18.96-15.83 | -17.32-15.59 | -14.41-18.6 | -17.66-18.12 | -13.11-12.8 | -18.87-18.15 | -17.32-14.94 | -12.71-14.85 | -14.04-16.04 | -18.22-17.47 | -18.97-19.19 | -19.32-17.91 | -18.77-17.73 | -19.04-18.45 | -18.84-18.87 | -14.17-16.93 | -17.88-14.09 | -14.68-15.5 | -18.41-18.32 | -18.46-15.35 | | | | | | |
| Theta(65°) | -10.21-18.89 | -18.41-11.02 | -17.24-14.84 | -17.59-18.65 | -18.04-14.08 | -18.45-11.12 | -11.64-13.17 | -11.14-13.38 | -16.65-18.77 | -19.12-19.36 | -18.39-15.62 | -14.99-17.74 | -15.06-14.21 | -18.68-15.77 | -17.89-17.61 | -18.49-16.01 | -18.07-18.52 | -18.83-17.94 | -18.36-19.24 | -17.79-17.77 | -18.38-17.98 | -13.68-19 | -18.92-15.58 | -12.31-10.77 | | | | | | |
| Theta(70°) | -12.15-17.29 | -14.61-11.43 | -16.25-14.78 | -14.42-18.68 | -17.83-10.06 | -18.11-38 | -11.68-9.39 | -11.67-13.11 | -17.94-17.85 | -18.49-15.99 | -18.68-19.46 | -18.21-17.52 | -17.71-19.12 | -18.47-18.88 | -18.22-18.39 | -15.55-18.85 | -18.66-17.96 | -16.91-18.9 | -19.18-18.85 | -18.21-18.65 | -18.55-17.37 | -11.73-11.51 | -14.84-17.92 | -18.41-16.34 | | | | | | |
| Theta(75°) | -12.54-17.77 | -18.95-14.8 | -19.04-11.59 | -19.31-18.81 | -18.62-11.24 | -18.45-11.13 | -11.35-9.76 | -11.63-14.19 | -17.95-18.63 | -14.66-11.52 | -19.03-19.46 | -18.35-18.11 | -17.46-17.17 | -19.26-18.64 | -16.23-17.33 | -19.68-18.09 | -17.81-17.84 | -17.85-18.07 | -19.91-14.28 | -15.18-8.2 | -19.13-19.05 | -18.85-13.97 | -16.92-17.99 | -15.61-13.42 | | | | | | |
| Theta(80°) | -18.76-16.11 | -16.27-14.16 | -16.11-16.25 | -17.93-18.08 | -14.29-15.53 | -18.41-15.42 | -14.22-10.69 | -18.61-16.37 | -17.33-14.93 | -17.72-17.82 | | | | | | | | | | | | | | | | | | | | |



Radiated Composite Gain Data of 2.4GHz&5GHz&5.9GHz

Appendix A

| Freq(Hz) | Theta | Phi(75°) | Phi(85°) | Phi(90°) | Phi(95°) | Phi(100°) | Phi(105°) | Phi(110°) | Phi(115°) | Phi(120°) | Phi(125°) | Phi(130°) | Phi(135°) | Phi(140°) | Phi(145°) | Phi(150°) | Phi(155°) | Phi(160°) | Phi(165°) | Phi(170°) | Phi(175°) | Phi(180°) | Phi(185°) | Phi(190°) | Phi(195°) | Phi(200°) | Phi(205°) | Phi(210°) | Phi(215°) | Phi(220°) | Phi(225°) | Phi(230°) | Phi(235°) | Phi(240°) | Phi(245°) | Phi(250°) | Phi(255°) | Phi(260°) | Phi(265°) | Phi(270°) | Phi(275°) | Phi(280°) | Phi(285°) | Phi(290°) | Phi(295°) | Phi(300°) | Phi(305°) | Phi(310°) | Phi(315°) | Phi(320°) | Phi(325°) | Phi(330°) | Phi(335°) | Phi(340°) | Phi(345°) | Phi(350°) | Phi(355°) | Phi(360°) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Theta(75°) | -11.39/-10.37 | -12.96/-9.65 | -8.31/-14.2 | -17.91/-17.3 | -18.76/-18.98 | -18.27/-18.42 | -17.01/-13.43 | -19.08/-18.64 | -17.26/-17.74 | -17.97/-18.23 | -18.31/-18.73 | -19.12/-19.05 | -18.09/-17.53 | -19.38/-18.45 | -14.94/-11.03 | -18.41/-12.61 | -12.42/-13.39 | -12.79/-18.24 | -18.57/-11.51 | -14.33/-15.69 | -13.04/-17.37 | -19.2/-14.59 | -10.92/-9.49 | -7.49/-17.59 | Theta(75°) | -16.13/-17.82 | -18.95/-12.44 | -6.39/-10.6 | -14.61/-12.84 | -16.33/-17.95 | -19.18/-17.74 | -14.97/-13.41 | -18.03/-17.55 | -19.21/-18.36 | -18.95/-17.63 | -18.62/-17.4 | -18.14/-18.7 | -18.94/-14.7 | -13.56/-14.1 | -12.62/-11.24 | -18.33/-10.28 | -11.2/-11.74 | -12.69/-18.42 | -18.5/-11.56 | -14.01/-10.24 | -18.19/-17.34 | -19.09/-16.4 | -13.08/-12.35 | -10.44/-15.91 | Theta(85°) | -17.39/-17.91 | -15.84/-18.23 | -9.11/-17.52 | -13.69/-8.77 | -12.92/-11.87 | -14.65/-16.72 | -17.95/-18.32 | -18.76/-17.89 | -18.75/-18.26 | -18.11/-17.83 | -17.82/-17.09 | -18.35/-17.33 | -13.49/-12.29 | -12.71/-11.39 | -8.95/-12.29 | -18.42/-9.97 | -10.99/-18.72 | -18.92/-17.72 | -17.92/-16.28 | -14.16/-9.5 | -14.21/-19.16 | -15.16/-17.98 | -18.28/-17.43 | -14.58/-19.94 | -8.73/-9.87 | Theta(90°) | -12.57/-11.94 | -9.43/-18.56 | -18.89/-6.67 | -14.95/-8.9 | -9.19/-10.74 | -12.24/-12.27 | -18.31/-18.81 | -18.85/-17.79 | -18.28/-18.06 | -18.08/-18.31 | -17.82/-12.67 | -15.43/-13.49 | -14.71/-17.71 | -9.64/-10.23 | -11.23/-13.84 | -14.89/-15.11 | -18.36/-15.8 | -18.15/-16.17 | -13.86/-11.94 | -14.67/-19.24 | -13.03/-18.97 | -15.08/-14.41 | -13.73/-18.36 | -16.08/-10.21 | Theta(95°) | -10.38/-9.58 | -9.02/-15.57 | -18.58/-11.96 | -14/-11.59 | -10.42/-12 | -9.05/-15.85 | -13.32/-18.2 | -18.83/-16.3 | -18.16/-15 | -18.6/-17.1 | -18.62/-19.2 | -15.37/-18.84 | -10.66/-11.13 | -12.86/-18.53 | -10.42/-18.38 | -16.24/-19.48 | -18.64/-18.28 | -13.16/-14.8 | -10.87/-9.36 | -19.17/-19.26 | -18.15/-18.11 | -11.52/-15.85 | -17.94/-17.81 | -8.57/-14.45 | Theta(100°) | -8.41/-6.46 | -10.66/-9.54 | -19.24/-11.66 | -14.93/-18.81 | -10.75/-15.48 | -10.75/-17.35 | -16.51/-18.44 | -15.64/-18.95 | -17.94/-16.73 | -17.19/-18.56 | -18.15/-16.83 | -10.73/-18.68 | -12.55/-18.17 | -16.66/-18.56 | -17.95/-18.03 | -16.66/-19.36 | -16.46/-11.22 | -17.92/-16.28 | -14.16/-9.5 | -14.21/-19.16 | -15.16/-17.98 | -18.28/-17.43 | -14.58/-19.94 | -8.73/-9.87 | Theta(105°) | -11.59/-6.78 | -11.44/-12.42 | -18.32/-18.84 | -13.77/-18.18 | -14.29/-19.24 | -15.48/-17.02 | -14.59/-18.12 | -16.33/-17.41 | -17.58/-18.72 | -17.24/-18.19 | -18.67/-17.28 | -18.51/-18.53 | -18.56/-15.8 | -18.91/-18.14 | -17.91/-9.81 | -18.88/-18.55 | -16.23/-12.47 | -18.08/-14.43 | -14.03/-10.87 | -19.41/-18.06 | -11.61/-18.16 | -17.46/-17.94 | -12.35/-13.93 | -11.88/-9.37 | Theta(110°) | -15.39/-11.51 | -12.13/-18.34 | -18.58/-17.15 | -14.75/-17.86 | -17.17/-18.22 | -16.15/-18.86 | -18.77/-17.96 | -17.96/-17.58 | -18.73/-18.73 | -17.82/-18.26 | -18.31/-18.72 | -17.14/-13.87 | -18.12/-17.99 | -19.14/-11.92 | -18.11/-14 | -16.23/-18.36 | -13.08/-18.63 | -19.34/-15.6 | -19.52/-17.71 | -16.37/-17.41 | -12.15/-19.03 | -18.69/-17.42 | -8.11/-14 | -10.22/-9.39 | -14.51/-18.46 | Theta(115°) | -15.35/-15.37 | -15.94/-18 | -17.62/-19.24 | -16.49/-16.81 | -17.99/-17.23 | -17.88/-18.07 | -19.04/-19.42 | -18.07/-17.62 | -19.11/-16.98 | -18.67/-18.57 | -18.71/-13.93 | -18.87/-18.12 | -16.51/-19.09 | -17.41/-17.96 | -15.56/-12.13 | -16.46/-19.34 | -16.33/-15.23 | -17.6/-18.49 | -15.36/-19.27 | -12.26/-17.45 | -11.42/-18.59 | -17.99/-17.78 | -10.22/-9.39 | -14.51/-18.46 | Theta(120°) | -18.43/-16.44 | -18.26/-11.35 | -11.28/-18.73 | -17.74/-17.23 | -18.71/-15.33 | -18.81/-18.59 | -17.21/-18.13 | -18.84/-18.59 | -15.55/-17.19 | -19.26/-18.5 | -17.94/-18.93 | -13.5/-16.97 | -17.8/-17.78 | -17.51/-17.18 | -18.44/-18.19 | -14.34/-19.03 | -13.64/-18.88 | -19.31/-18.99 | -18.63/-15.57 | -16.97/-18.34 | -17.21/-15.29 | -18.97/-11.25 | -18.05/-7.74 | -10.25/-18.1 | Theta(125°) | -17.91/-17.85 | -18.96/-13.04 | -18.87/-18.16 | -19.25/-19.09 | -18.64/-19.39 | -18.36/-17.93 | -18.04/-18.96 | -15.86/-18.94 | -17.82/-19.19 | -18.48/-16.32 | -17.84/-14.23 | -19.1/-18.86 | -8.91/-17.17 | -13.52/-12.54 | -14.95/-17.95 | -13.58/-18.51 | -18.93/-18.2 | -18.29/-16.49 | -17.81/-17.77 | -18.46/-13.2 | -18.91/-14.08 | -14.19/-14.99 | -12.89/-18.84 | Theta(130°) | -17.47/-18.14 | -18.19/-16.39 | -15.13/-17.96 | -15.45/-18.87 | -18.28/-17.47 | -17.47/-17.85 | -18.49/-15.24 | -18.75/-17.11 | -19.1/-17.64 | -18.38/-18.23 | -18.91/-18.75 | -18.09/-16.32 | -12.11/-16.37 | -15.95/-18.47 | -15.95/-16.6 | -18.84/-18.59 | -18.06/-18.16 | -19.17/-13.3 | -14.38/-14.36 | -14.13/-18.45 | -15.47/-14.27 | -18.48/-15.94 | -10.91/-11.18 | -10.52/-14.78 | Theta(135°) | -18.76/-16.73 | -17.41/-19.27 | -17.88/-19.1 | -18.61/-14.73 | -16.96/-17.69 | -18.14/-18.04 | -18.41/-17.75 | -18.53/-17.8 | -17.29/-18.95 | -17.08/-19.29 | -17.31/-18.68 | -16.64/-14.28 | -13.21/-16.64 | -14.53/-12.16 | -13.85/-13.33 | -16.99/-17.74 | -15.76/-13.6 | -17.59/-17.68 | -11.11/-10.95 | -13.14/-19.2 | -13.81/-14.25 | -15/-12.98 | -11.58/-12.63 | -16.66/-18.26 | Theta(140°) | -18.51/-18.78 | -17.81/-19.01 | -17.85/-18.85 | -19.11/-18.47 | -18.11/-18.04 | -18.04/-18.96 | -18.04/-18.96 | -17.82/-19.19 | -18.48/-16.32 | -17.84/-14.23 | -19.1/-18.86 | -8.91/-17.17 | -13.52/-12.54 | -14.95/-17.95 | -13.58/-18.51 | -18.93/-18.2 | -18.29/-16.49 | -17.81/-17.77 | -18.46/-13.2 | -18.91/-14.08 | -14.19/-14.99 | -12.89/-18.84 | Theta(145°) | -17.91/-18.46 | -18.47/-18.57 | -18.43/-17.85 | -18.42/-18.71 | -18.79/-18.47 | -17.91/-19.42 | -18.64/-18.16 | -17.89/-18.86 | -18.66/-16.81 | -18.47/-14.13 | -14.59/-17.93 | -17.96/-18.52 | -15.74/-15.34 | -14.35/-13.7 | -13.38/-16.91 | -10.99/-16.32 | -13.51/-16.64 | -19.02/-14.1 | -15.91/-11.25 | -14.33/-12.66 | -15.61/-17.92 | Theta(150°) | -15.19/-18.9 | -17.69/-18.92 | -18.57/-17.98 | -17.87/-17.89 | -18.35/-18.1 | -18.11/-18.95 | -17.45/-16.99 | -17.35/-17.48 | -18.19/-18.22 | -18.44/-18.97 | -14.18/-18.21 | -15.45/-18.31 | -19.14/-18.95 | -19.94/-18.88 | -18.42/-18.67 | -19.39/-18.88 | -18.45/-18.08 | -18.61/-19.14 | -18.99/-17.87 | -18.29/-18.11 | -18.28/-18.18 | -18.54/-19.48 | -18.44/-18.27 | -17.74/-19.21 | Theta(155°) | Gain | Phi(75°) | Phi(85°) | Phi(90°) | Phi(95°) | Phi(100°) | Phi(105°) | Phi(110°) | Phi(115°) | Phi(120°) | Phi(125°) | Phi(130°) | Phi(135°) | Phi(140°) | Phi(145°) | Phi(150°) | Phi(155°) | Phi(160°) | Phi(165°) | Phi(170°) | Phi(175°) | Phi(180°) | Phi(185°) | Phi(190°) | Phi(195°) | Phi(200°) | Phi(205°) | Phi(210°) | Phi(215°) | Phi(220°) | Phi(225°) | Phi(230°) | Phi(235°) | Phi(240°) | Phi(245°) | Phi(250°) | Phi(255°) | Phi(260°) | Phi(265°) | Phi(270°) | Phi(275°) | Phi(280°) | Phi(285°) | Phi(290°) | Phi(295°) | Phi(300°) | Phi(305°) | Phi(310°) | Phi(315°) | Phi(320°) | Phi(325°) | Phi(330°) | Phi(335°) | Phi(340°) | Phi(345°) | Phi(350°) | Phi(355°) | Phi(360°) |



Radiated Composite Gain Data of 2.4GHz&5GHz&5.9GHz

Appendix A

| Theta (112.5°) | -13.14/-10.9 | -11.48/-18.46 | -17.68/-17.36 | -18.74/-19.2 | -17.79/-17.53 | -13.71/-19.06 | -18.78/-17.41 | -18.37/-19 | -18.14/-18.63 | -17.54/-17.18 | -17.88/-18.28 | -18.19/-14.29 | -17.86/-18.61 | -18.06/-19.26 | -17.45/-18.85 | -18.77/-18.75 | -10.39/-17.98 | -18.71/-13.88 | -10.37/-13.4 | -18.06/-18.87 | -17.71/-18.86 | -18.05/-18.92 | -18.31/-15.28 | -15.54/-11.2 |
|----------------|------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Theta (120°) | -18.55/-13.2 | -18.29/-18.42 | -15.54/-15.76 | -17.72/-17.97 | -18.14/-18.81 | -15.91/-18.91 | -17.98/-18.76 | -18.31/-17.59 | -18.63/-19.91 | -18.83/-19.04 | -17.58/-18.19 | -18.07/-18.36 | -18.52/-18.32 | -17.13/-17.99 | -19.03/-18.33 | -14.22/-18.26 | -17.3/-18.36 | -18.96/-17.85 | -18.87/-18.11 | -14.67/-15.05 | -13.69/-18.82 | -17.12/-13.56 | -10.45/-19.07 | -10.07/-17.95 |
| Theta (127.5°) | -19.39/-17.45 | -18.97/-18.31 | -16.26/-16.76 | -17.95/-18.61 | -18.14/-17.78 | -17.45/-18.82 | -17.81/-18.3 | -17.01/-17.7 | -16.15/-18.61 | -17.86/-18.26 | -17.43/-17.81 | -19.01/-17.09 | -17.09/-12 | -18.82/-13.21 | -15.41/-16.74 | -18.67/-18.61 | -17.01/-10.32 | -18.51/-17.81 | -15.71/-17.38 | -12.07/-19.24 | -18.25/-15.13 | -17.71/-16.05 | -10.47/-19.05 | -11.21/-15.52 |
| Theta (135°) | -15.14/-18.81 | -18.37/-17.3 | -17.3/-18.53 | -18.65/-17.21 | -17.91/-18.88 | -18.51/-17.69 | -18.61/-19.12 | -18.65/-19.01 | -17.39/-19 | -16.52/-18.4 | -16.32/-18.27 | -19.82/-18.38 | -18.41/-16.52 | -17.72/-16.64 | -18.83/-18.16 | -17.29/-18.18 | -16.15/-17.48 | -17.72/-19.07 | -19.19/-18.03 | -17.41/-17.46 | -18.33/-13.94 | -18.22/-9.33 | -14.54/-15.77 | -16.46/-15.4 |
| Theta (142.5°) | -18.29/-15.43 | -14.31/-18 | -18.15/-18.37 | -19.43/-15.44 | -18.51/-18.55 | -18.5/-17.89 | -17.97/-18.19 | -18.65/-18.86 | -18.35/-18.05 | -18.49/-17.78 | -16.01/-18.48 | -15/-18.55 | -14.8/-15.98 | -18.95/-18.14 | -14.31/-18.02 | -16.19/-18.74 | -17.85/-19.13 | -18.51/-17.93 | -18.98/-18.12 | -17.63/-18.14 | -18.01/-17.32 | -19.31/-12.05 | -18.49/-14.51 | -15.51/-19.38 |
| Theta (150°) | -13.47/-16.06 | -17.51/-12.82 | -13.33/-11.05 | -14.72/-18.95 | -17.3/-14.85 | -17.36/-18.35 | -18.66/-18.34 | -17.47/-18.63 | -18.17/-18.39 | -16.93/-17.9 | -19.32/-13.38 | -13.33/-17.39 | -18.16/-14.33 | -18.16/-17.58 | -16.47/-17.56 | -19.36/-17.95 | -17.37/-15.18 | -14.25/-18.84 | -15.06/-15.48 | -12.38/-18.51 | -16.09/-17.78 | -17.8/-12.63 | -12.4/-12.63 | -12.09/-13.94 |
| Theta (157.5°) | -18.59/-18.35 | -18.96/-18.02 | -18.77/-17.98 | -17.63/-18.23 | -18.62/-15.3 | -13.04/-13.15 | -16.24/-17.49 | -16.89/-18.81 | -16.81/-17.31 | -16.44/-18.44 | -15.72/-18.67 | -12.63/-18.95 | -18.28/-18.81 | -18.31/-18.49 | -18.08/-18.88 | -16.03/-17.24 | -18.27/-13.37 | -14.4/-17.65 | -14.04/-12.33 | -13.59/-18.51 | -15.67/-17.38 | -18.06/-17.43 | -12.45/-17.83 | -14.92/-14.3 |
| Theta (165°) | -14.34/-15.38 | -16.54/-18.24 | -18.5/-17.86 | -17.08/-15.61 | -17.97/-18.17 | -16.11/-14.77 | -16.36/-18.95 | -18.27/-13.84 | -16.51/-16.47 | -18.79/-18.83 | -17.37/-18.15 | -18.48/-17.66 | -18.81/-18.89 | -18.19/-18.77 | -18.21/-16.02 | -17.07/-17.88 | -17.68/-18.43 | -18.47/-17.98 | -18.27/-17.4 | -18.18/-16.81 | -18.18/-19.05 | -17.76/-18.15 | -14.57/-14.7 | -12.42/-13.04 |
| Theta (172.5°) | -17.39/-17.13 | -17.53/-17.12 | -16.7/-16.26 | -13.61/-13.29 | -14.14/-17.1 | -13.27/-14.33 | -19.08/-16.9 | -17.18/-17.62 | -18.27/-18.62 | -18.16/-18.94 | -17.76/-18.11 | -18.29/-19.23 | -17.11/-18.47 | -18.51/-17.61 | -18.34/-17.42 | -16.08/-15.77 | -16.26/-17.4 | -16/-18.38 | -17.81/-18.37 | -18.1/-18.72 | -18.58/-17.81 | -18.92/-16.33 | -18.81/-18.32 | -19.28/-17.15 |
| Theta (180°) | -17.14/-17.62 | -19.76/-18.16 | -19.03/-17.98 | -19.33/-17.82 | -18.76/-18.14 | -19.05/-18.95 | -17.99/-18.86 | -19.22/-18.1 | -19.01/-17.56 | -17.71/-18.68 | -15.85/-17.55 | -16.32/-18.88 | -18.69/-19.02 | -19.18/-18.57 | -18.61/-15.8 | -16.53/-18.43 | -15.49/-15.36 | -17.17/-15.66 | -17.07/-18.24 | -16.21/-17.75 | -18.15/-19.37 | -17.61/-18.27 | -16.21/-13.81 | -15.52/-13.6 |
| Freq(Hz) | 5.885GPol. | Theta/Ant. 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 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 (0°) | -16.88/-18.09 | -18.42/-17.33 | -18.36/-18.48 | -19/-18.57 | -17.89/-17.3 | -17.91/-17.12 | -17.29/-15.47 | -15.54/-12.5 | -12.87/-11.71 | -12.41/-12.54 | -12.22/-12.4 | -13.22/-14.54 | -14.09/-16.39 | -15.85/-17.17 | -18.68/-17.43 | -19.18/-18.97 | -18.21/-19.06 | -18.27/-17.74 | -17.83/-17.87 | -17.99/-17.93 | -17.51/-16.75 | -17.49/-15.78 | -18.31/-15.51 | -17.55/-18.02 |
| Theta (7.5°) | -10.76/-11.58 | -13.09/-14.05 | -16.38/-17.7 | -17.98/-18.51 | -18.99/-18.86 | -19.05/-19.04 | -18.72/-18.27 | -18.76/-18.47 | -18.89/-16.78 | -19.15/-16.17 | -15.41/-18.33 | -15.02/-18.83 | -18.14/-18.79 | -16.08/-18.4 | -18.74/-19.46 | -18.05/-17.82 | -18.02/-17.17 | -18.2/-15.6 | -14.73/-13.01 | -12.57/-11.92 | -10.66/-11.22 | -9.32/-10.03 | -10.34/-10.77 | -10.41/-10.52 |
| Theta (15°) | -9.08/-10.16 | -11.56/-14.15 | -14.75/-13.5 | -15.03/-17 | -16.82/-18.77 | -18.29/-18.86 | -18.78/-18.65 | -18.25/-18.87 | -18.65/-17.69 | -17.95/-17.65 | -17.93/-18.08 | -17.94/-17.37 | -17.96/-18.81 | -18.06/-19.2 | -17.27/-15.25 | -16.98/-19.12 | -15.56/-10.43 | -8.61/-9.01 | -9.5/-12.61 | -10.25/-9.55 | -9.24/-8.11 | -8.86/-8.87 | -8.32/-8.98 | -9.25/-9.67 |
| Theta (22.5°) | -4.72/-6.02 | -7.45/-7.75 | -7.78/-7.72 | -10.71/-18.06 | -18.42/-18.23 | -17.96/-17.65 | -17.51/-17.49 | -16.95/-18.33 | -16.95/-17.92 | -15.62/-17.26 | -17.08/-18.25 | -17.41/-11.08 | -13.61/-19 | -18.94/-18.31 | -14.63/-14.28 | -10.39/-9.98 | -10.15/-11.16 | -10.05/-10.79 | -8.25/-9.82 | -7.84/-9.6 | -9.11/-8.55 | -9.31/-7.91 | -8.21/-6.33 | -5.39/-5.78 |
| Theta (30°) | -6.34/-6.29 | -6.15/-7.12 | -7.14/-8.9 | -9.42/-11.2 | -9.59/-8.49 | -9.27/-8.74 | -11.63/-13.37 | -12.57/-14.35 | -18.64/-14.19 | -12.99/-11.08 | -7.71/-11.25 | -15.37/-9.96 | -16.21/-19.29 | -8.97/-7.81 | -15.02/-7.53 | -4.1/-6.96 | -5.71/-6.1 | -6.67/-6.44 | -7.1/-6.83 | -5.96/-5.48 | -7.15/-7.8 | -7.8/-7.43 | -6.57/-5.26 | -5.91/-6.42 |
| Theta (37.5°) | -6.79/-6.56 | -8.76/-3.46 | -3.3/-8.35 | -6.24/-6.69 | -5.14/-6.2 | -5.87/-9.67 | -8.46/-8.08 | -13/-8.52 | -14.05/-9.6 | -12.77/-17.7 | -8.24/-4.51 | -12.88/-10.62 | -10.76/-15.1 | -6.94/-9.42 | -4.06/-7.81 | -10.09/-4.64 | -7.58/-8.15 | -4.8/-4.35 | -6.88/-7.02 | -6.65/-6.92 | -6.41/-3.57 | -6.59/-6.18 | -5.41/-5.55 | -5.79/-5.89 |
| Theta (45°) | -3.32/-6.7 | -8.34/-6.48 | -4.87/-3.07 | -3.6/-5.95 | -3.38/-6.44 | -8.84/-6.63 | -6.33/-8.3 | -8.47/-7.48 | -7.59/-7.54 | -10.33/-9.81 | -8.12/-9.83 | -5.43/-9.68 | -9.43/-8.32 | -4.43/-5.33 | -6.34/-4.38 | -5.89/-4.36 | -8.52/-8.48 | -11.07/-9.84 | -7.37/-6.68 | -5.72/-6.6 | -7.43/-8 | -6.15/-9.04 | -12.93/-6.94 | -4.62/-4.35 |
| Theta (52.5°) | -9.4/-9.13 | -10.58/-7.94 | -5.43/-4.42 | -4.83/-3.13 | -3.24/-5.05 | -4.5/-8.02 | -7.81/-6.93 | -7.12/-7.54 | -9.29/-7.36 | -6.87/-9.08 | -5.59/-5.59 | -4.98/-6.98 | -9.79/-7.12 | -4.51/-4.69 | -9.18/-5.85 | -6.93/-8.82 | -9.18/-12.68 | -7.03/-11.62 | -15.28/-16.75 | -14.45/-13.12 | -14.64/-11.3 | -9.01/-8.87 | -9.96/-10.54 | -17.89/-18.14 |
| Theta (60°) | -5.52/-2.51 | -7.18/-7.68 | -8.04/-9.2 | -6.5/-5.95 | -3.48/-5.26 | -4.06/-10.97 | -4.98/-5.49 | -8.03/-6.14 | -5.33/-5.65 | -6.81/-7.81 | -10.68/-5.09 | -7.58/-6.71 | -9.74/-5.03 | -6.19/-7.03 | -13.23/-5.04 | -12.07/-10.42 | -3.88/-5.86 | -10.22/-3.09 | -4.17/-0.35 | -0.31/-0.94 | -1.22/-0.47 | -2.84/-4.24 | -0.92/-0.32 | -1.12/-1.53 |
| Theta (67.5°) | -5.97/-2.02 | -1.93/-0.25 | -7.32/-9.73 | -8.7/-7.02 | -10.23/-2.2 | -4.97/-8.18 | -7.22/-6.92 | -7.26/-7.91 | -7.19/-11.16 | -7.77/-6.03 | -10.33/-8.03 | -9.39/-6.98 | -4.73/-3.5 | -10.88/-9.57 | -4.78/-6.2 | -6.66/-2.79 | -6.3/-0.8 | -4.42/-1.67 | -3.18/-3.62 | -3.62/-2.8 | -1.58/-2.22 | -4.29/-11.16 | -11.78/-4.48 | -3.14/-2.4 |
| Theta (75°) | -7.18/-5.07 | -1.95/-1.45 | -0.16/-4.15 | -2.28/-3.02 | -6.91/-1.14 | -2.27/-3.88 | -3.92/-6.26 | -5.61/-5.07 | -7.13/-7.67 | -8.33/-7.36 | -8.38/-5.25 | -4.56/-1.96 | -5.15/-2.95 | -3.86/-2.15 | 0.38/-2.14 | -0.31/-1.55 | -0.18/-0.06 | 0.41/-3.88 | -4.13/-15.26 | -12.92/-4.87 | -7.71/-8.06 | -3.84/-2.43 | -6.06/-5.63 | -5.21/-6.18 |
| Theta (82.5°) | -1.98/-1.29 | 1.38/1.07 | 1.84/-0.29 | 1.80/4.4 | 0.73/0.7 | 0.66/0.74 | -0.33/-3.27 | -2.02/-2.48 | -5.34/-3.8 | -1.75/-4.74 | -2.54/-1.3 | -0.63/-0.43 | -1.63/-1.11 | 0.82/73 | 2.90/18 | 3.19/45 | 2.52/-1.02 | 2.68/0.05 | -1.3/-2.29 | -6.76/-6.75 | 0.43/-0.72 | -0.93/-3.46 | -2.28/-0.61 | -0.13/-3.29 |
| Theta (90°) | -1.07/0.51 | 2.71/1.73 | 1.42/1.6 | 2.88/2.38 | 5.01/3.49 | 2.67/2.9 | 2.27/1.23 | 1.1/-1.53 | -1.65/-0.7 | 2.92/1.82 | 2.07/-0.14 | 1.41/5.2 | 0.84/1.74 | 4.34/3.35 | 4.55/2.87 | 3.27/0.22 | 3.01/2.11 | 3.08/1.11 | -1.19/0.1 | 0.23/-1.4 | 2.04/-3.38 | -0.09/-3.4 | -1/1.04 | -0.53/-0.49 |
| Theta (97.5°) | -4.92/-0.08 | 1.38/1.47 | 1.55/0.58 | 2.65/3.61 | 5.66/4.96 | 3.44/4.14 | 3.82/3.31 | 2.82/1.36 | 0.51/1.1 | 3.81/2.85 | 2.50/65 | 2.49/3.53 | 2.04/2.01 | 4.89/4.06 | 3.17/3.5 | 2.31/0.11 | -1.48/0.66 | 0.51/-9.78 | -8.84/-1.6 | -4.21/-1.56 | 1.58/6.15 | -5.56/-8.04 | -4.43/1.18 | -3.71/0.35 |
| Theta (105°) | -13.51/-4.49 | -3.15/-0.83 | -0.08/-2.77 | 0.34/1.52 | 4.94/4.15 | 3.02/3.83 | 3.02/3.04 | 1.85/-0.53 | -1.25/0.3 | 3.07/1.37 | 1.78/1.02 | 3.36/4.08 | 1.50/96 | 1.21/1.11 | 3.08/0.48 | 0.67/-2.6 | -6.37/-3.6 | -7.37/-19 | -17.67/-8.03 | -6.07/-8.22 | -6.62/-8.56 | -10.45/-7.84 | -11.18/-5.24 | -6.64/-4.7 |
| Theta (112.5°) | -18.29/-18.03 | -9.53/-5.89 | -2.77/-5.08 | -3.19/-1.57 | 1.21/0.83 | 0.21/1.13 | -0.09/0.69 | -0.39/-0.81 | -2.36/-1.32 | 1.33/-1.29 | -0.37/-1.32 | -0.63/-0.03 | -2.75/-2.83 | -1.56/-2.61 | -0.51/-2.36 | -7.59/-6.89 | -7.62/-11.86 | -17.69/-13.6 | -15.71/-18.94 | -12.42/-11.78 | -2.97/-5.45 | -10.16/-13.17 | -7.92/-7.6 | -6.44/-19.23 |
| Theta (120°) | -12.12/-11.56 | -9.25/-13.86 | -9.71/-12.95 | -12.75/-6.46 | -4.94/-7.7 | -5.98/-4.35 | -2.59/-4.86 | -4.99/-5.86 | -4.21/-5.04 | -1.85/-6.61 | -4.16/-6.04 | -6.57/-4.8 | -7.11/-6.63 | -10.86/-14.57 | -6.48/-8.31 | -10.06/-7.57 | -4.79/-11.63 | -18.15/-9.83 | -5.11/-5.28 | -6.43/-19.24 | -10.85/-6.62 | -5.9/-9.99 | -6.86/-3.36 | -4.11/-6.79 |
| Theta (127.5°) | -19.24/-18.46 | -13.82/-17.41 | -11.38/-15.39 | -8.96/-13.33 | -11.17/-12.29 | -12.21/-16.89 | -7.29/-7.86 | -7.45/-14.83 | -12.26/-16.47 | -12.82/-9.8 | -18.31/-13.13 | -9.08/-8.26 | -10.88/-11.84 | -10.79/-12.22 | 4.57/-13.87 | -5.25/-6.22 | -13.16/-17.91 | -11.73/-6.08 | -19.53/-19.06 | -12.65/-15.54 | -13.54/-8.7 | -19.19/-10.94 | -13.16/-9.36 | -17.15/-9.7 |
| Theta (135°) | -9.09/-9.34 | -7.85/-8.45 | -6.69/-9.77 | -7.42/-8.97 | -11.51/-11.27 | -9.18/-10.6 | -15.37/-11.3 | -15.63/-11.56 | -16.91/-18.62 | -17.51/-10.51 | -14.22/-19.01 | -10.25/-6.63 | -11.4/-8.5 | -6.63/-8.15 | -4.87/-7.58 | -2.66/-4.84 | -4.09/-4.96 | -15.22/-11.36 | -12.68/-6.91 | -9.4/-18.56 | -11.86/-8.17 | -12.37/-18.27 | -8.54/-3.45 | -5.77/-11.96 |
| Theta (142.5°) | -8.28/-13.87 | -8.92/-9.36 | -6/-10.27 | -6.1/-5.74 | -9.04/-10.98 | -7.19/-6.01 | -5.64/-6.69 | -9.01/-6.76 | -7.23/-6.68 | -7.26/-14.34 | -8.91/-7.22 | -8.81/-2.25 | -3.76/-6.09 | -5.68/-9.94 | -7.42/-5.67 | -7.66/-2.97 | -2.71/-7.38 | -12.69/-12.32 | -9.4/-6.92 | -18.38/-12.02 | -17.13/-16.16 | -10.25/-11.4 | -17.86/-14.53 | -9.22/-12.43 |
| Theta (150°) | -12.98/-9.63 | -10.16/-14.51 | -8.25/-6.11 | -13.11/-6.61 | -5.21/-6.96 | -8.16/-7.73 | -6.53/-6.36 | -6.08/-5.29 | -5.51/-7.66 | -8.21/-9.46 | -9.76/-6.59 | -9.13/-5.71 | -2.17/-3.15 | -5.72/-10.15 | -8.58/-9.2 | -10.27/-12.44 | -13.79/-6.06 | -8.85/-7.56 | -14.89/-17.34 | | | | | |



| Freq(Hz) | 6.175G | 6.475G | 6.695G | 6.995G |
|---|------------------|----------------|------------------|------------------|
| Ant. 1 Max Gain (dBi) | 4.44 | 4.67 | 4.72 | 5.69 |
| Ant. 2 Max Gain (dBi) | 5.23 | 4.75 | 5.27 | 4.4 |
| Ant. 3 Max Gain (dBi) | 4.46 | 4.71 | 5.87 | 5.89 |
| Ant. 4 Max Gain (dBi) | 5.3 | 4.53 | 5.86 | 5.8 |
| Ant. 1 Polarization/ θ (°)/ ϕ (°) | Theta/90/52.5 | Theta/90/52.5 | Theta/82.5/22.5 | Theta/90/60 |
| Ant. 2 Polarization/ θ (°)/ ϕ (°) | Theta/90/7.5 | Theta/90/322.5 | Theta/90/292.5 | Theta/90/292.5 |
| Ant. 3 Polarization/ θ (°)/ ϕ (°) | Theta/90/352.5 | Theta/90/322.5 | Theta/82.5/247.5 | Theta/90/315 |
| Ant. 4 Polarization/ θ (°)/ ϕ (°) | Theta/97.5/217.5 | Theta/90/217.5 | Theta/97.5/120 | Theta/97.5/112.5 |
| Max Gain (dBi) | 5.3 | 4.75 | 5.87 | 5.89 |
| DG [1SS] (dBi) | 8.72 | 8.18 | 8.76 | 8.3 |
| DG [2SS] (dBi) | 5.72 | 5.18 | 5.87 | 5.89 |
| DG [4SS] (dBi) | 5.3 | 4.75 | 5.87 | 5.89 |



Radiated Composite Gain Data of 6GHz

Appendix B

| Theta (°) | -10.95-9.9 | -9.35-9.59 | -11.41-11.42 | -11.01-10.91 | -10.91-11.23 | -11.51-10.75 | -11.49-11.67 | -11.08-11.00 | -8.77-8.63 | -9.52-9.13 | -8.33-7.78 | -9.81-11.22 | -10.26-12.47 | -11.01-11.48 | -10.71-11.35 | -11.53-12.74 | -12.22-11.42 | -12.23-10.59 | -10.86-9.6 | -9.09-9.32 | -9.93-9.39 | -11.93-11.62 | -11.51-10.86 | -10.51-10.31 | |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--|
| Theta (15°) | -11.46-11.79 | -10.81-11.97 | -10.54-11.25 | -8.74-8.4 | -9.4-9.86 | -11.75-10.87 | -10.34-11.36 | -11.35-11.24 | -11.26-11.49 | -12.11-11.41 | -10.82-8.69 | -9.6-10.66 | -12.52-11.3 | -10.28-17.55 | -7.19-7.92 | -10.88-12.17 | -12.06-11.22 | -12.06-11.89 | -12.16-11.9 | -10.13-10.87 | -9.96-10.29 | -10.51-9.98 | -9.63-10.45 | -11.53-11.72 | |
| Theta (30°) | -9.31-9.56 | -9.4-11.02 | -10.52-10.22 | -12.33-11.62 | -9.17-10.05 | -8.58-9.25 | -11.67-7.79 | -8.02-11.22 | -12.4-11.93 | -12.09-12.05 | -11.04-9.33 | -10.96-12.2 | -11.33-10.84 | -10.37-8.76 | -11.22-10.54 | -10.78-11.76 | -12.15-11.97 | -10.8-9.73 | -7.22-9.03 | -10.79-9.91 | -9.11-8 | -6.41-9.56 | -10.86-11.57 | -11.44-10.86 | |
| Theta (45°) | -10.79-10.9 | -9.97-9.94 | -9.72-8.33 | -7.42-8.09 | -11.32-10.01 | -10.99-9.3 | -10.52-10.91 | -10.23-10.63 | -11.26-11.3 | -11.18-12.45 | -12.15-10.52 | -11.95-10.57 | -12.23-11.43 | -11.46-10.15 | -10.33-9.78 | -9.61-11.36 | -11.93-11.31 | -11.67-9.46 | -10.47-11.59 | -11.01-7.97 | -9.18-8.22 | -8.01-9.1 | -9.78-12.63 | -11.95-10.61 | |
| Theta (60°) | -7.63-6.26 | -8.27-9.79 | -9.13-7.02 | -10.93-9.23 | -7.49-8.18 | -8.31-10.61 | -7.63-9.72 | -8.83-9.44 | -9.65-8.45 | -12.6-10.44 | -11.64-10.74 | -10.48-10.35 | -8.74-12.16 | -12.45-9.46 | -7.42-7.1 | -8.78-8.1 | -12.32-11.31 | -11.17-11.37 | -11.38-10.94 | -11.5-9.55 | -9.45-9.58 | -11.16-10.34 | -8.45-10.24 | -9.64-8.52 | |
| Theta (75°) | -7.98-4.89 | -7.23-7.85 | -9.06-9.89 | -8.31-6.53 | -5.83-11.69 | -7.61-9.3 | -10.12-9.36 | -9.74-6.61 | -8.95-7.22 | -10.17-10.31 | -9.36-12.02 | -12.10.51 | -9.81-7.98 | -12.18-7.61 | -7.46-9.02 | -9.08-8.34 | -10.94-8.03 | -12.31-10.41 | -11.17-11.79 | -9.25-12.07 | -9.88-10.49 | -11.6-8.63 | -8.09-8.1 | -6.71-7.41 | |
| Theta (90°) | -10.72-8.38 | -7.53-7.3 | -9.27-7.74 | -8.25-7.98 | -6.02-9.05 | -8.74-8 | -8.88-10.01 | -6.02-7.52 | -11.68-6.55 | -10.42-11.08 | -8.89-9.37 | -9.33-7.97 | -10.05-7.75 | -10.88-7.52 | -9.46-6.39 | -8.39-10.22 | -10.65-11.88 | -11.29-11.5 | -11.27-12.28 | -11.31-11.01 | -10.92-9.93 | -9.18-6.38 | -8.58-9.88 | -8.63-9.78 | |
| Theta (105°) | -7.83-5.91 | -5.9-5.39 | -5.13-7 | -7.03-7.11 | -7.73-8.61 | -8.54-6.95 | -6.55-9.34 | -7.52-11.76 | -10.65-10.66 | -7.76-11.19 | -8.57-7.44 | -9.06-9.37 | -8.54-11.1 | -10.33-9.99 | -8.91-7.88 | -7.69-12.76 | -11.25-10.93 | -10.26-10.02 | -12.52-12.17 | -12.28-8.28 | -7.72-7.35 | -11.8-9.32 | -9.87-8.57 | | |
| Theta (120°) | -9.71-7.41 | -7.52-10.35 | -6.52-6.51 | -8.29-9.53 | -7.19-6.95 | -8.86-9.17 | -6.17-6.49 | -9.58-8.32 | -9.95-10.08 | -6.85-8.25 | -6.9-6.93 | -7.07-6.28 | -9.92-11.08 | -11.79-10.1 | -9.57-8.81 | -7.57-7.13 | -12.87-12 | -11.47-11.39 | -11.19-10.47 | -11.47-11.5 | -10.5-8.27 | -9.93-10.06 | -9.08-9.98 | -9.36-7.06 | |
| Theta (135°) | -8.89-9.82 | -8.92-8.07 | -8.3-8.2 | -9.65-9.44 | -5.71-7.44 | -5.74-7.81 | -6.12-7.64 | -10.32-9.98 | -9.96-11.41 | -10.06-11.07 | -9.15-9.36 | -7.83-7.89 | -12.32-11.28 | -12.11-11.32 | -10.69-10.52 | -8.88-9.79 | -12.73-11.15 | -10.76-10.54 | -10.56-11.91 | -10.68-9.98 | -12.07-12.54 | -9.44-9.36 | -7.43-7.85 | | |
| Theta (150°) | -9.41-12.18 | -10.58-8.16 | -7.79-7.24 | -10.91-11.13 | -5.9-7.45 | -4.75-6.16 | -6.64-8.45 | -10.07-9.23 | -8.62-12.14 | -12.28-10.14 | -9.32-10.63 | -9.69-10.15 | -11.57-10.68 | -11.21-11.5 | -11.1-8.84 | -10.78-10.33 | -10.97-11.97 | -12.34-12.45 | -12.6-11.15 | -10.23-10.83 | -11.58-11.1 | -10.63-7.69 | -8.24-8.29 | -6.93-8.1 | |
| Theta (165°) | -10.99-12.56 | -11.96-10.7 | -9.85-9.95 | -13.04-9.36 | -7.45-8.72 | -6.2-7.9 | -9.71-11.4 | -10.93-9.51 | -9.38-9.6 | -11.46-7.2 | -10.07-12.34 | -10.42-12.13 | -11.88-9.66 | -10.23-9.46 | -9.98-11.8 | -12.33-10.86 | -9.32-12.13 | -11.8-12.25 | -11.61-11.92 | -10.81-12.26 | -11.08-9 | -9.78-7.75 | -7.54-4.29 | -8.15-10.8 | |
| Theta (180°) | -9.48-10.62 | -9.51-11.08 | -7.24-9.17 | -11.79-9.76 | -8.64-7.59 | -9.57-9.35 | -9.15-10.59 | -9.5-9.55 | -8.74-9.75 | -12.46-9.91 | -10.24-9.49 | -11.16-11.18 | -10.82-8.6 | -9.56-10.63 | -9.97-9.27 | -11.39-7.18 | -11.13-9.82 | -12.71-12.28 | -9.82-11.46 | -10.38-6.7 | -7.01-6.84 | -6.98-7.13 | -4.95-6.81 | | |
| Theta (195°) | -8.38-7.03 | -8.26-7.29 | -10.18-9.89 | -10.96-9.86 | -8.05-7.44 | -10.26-8.81 | -9.92-9.02 | -10.12-10.15 | -9.74-9.82 | -10.15-9.94 | -10.19-12.54 | -8.55-10.79 | -9.29-10.09 | -11.05-9.54 | -6.3-9.96 | -9.7-8.48 | -7.58-8.26 | -11.13-12.48 | -10.3-8.91 | -10.64-9.7 | -5.11-9.42 | -8.99-7.95 | -7.41-11.41 | -7.13-7.7 | |
| Theta (210°) | -8.75-7.8 | -9.37-10.94 | -10.05-12.24 | -9.69-9.67 | -6.96-8.42 | -7.18-9.77 | -9.67-8.02 | -9.33-9.38 | -9.62-9.03 | -10.59-10.87 | -9.99-8.47 | -10.42-10.66 | -9.71-8.57 | -10.24-10.95 | -9.21-8.29 | -10.74-10.01 | -7.5-6.98 | -10.98-8.91 | -8.08-9.33 | -8.38-11.5 | -4.98-8.53 | -6.83-6.98 | -6.15-11.35 | -8.93-7.53 | |
| Theta (225°) | -1.52-6.41 | -7.66-9.37 | -11.13-8.88 | -5.47-9.5 | -12.1-8.16 | -9.69-9.06 | -10.15-9.58 | -10.86-10.43 | -9.69-9.94 | -9.1-9.26 | -10.8-8.63 | -6.87-7.75 | -6.26-5.54 | -8.51-9.4 | -8.1-9.96 | -5.1-8.08 | -5.12-7.11 | -11.03-10.34 | -9.18-12.47 | -9.91-10.58 | -5.49-4.95 | -5.74-7.46 | -6.37-6.26 | -5.44-5.91 | |
| Theta (240°) | -8.65-6.1 | -7.66-7.33 | -6.16-6.4 | -5.19-4.71 | -9.12-8.27 | -7.81-9.88 | -9.63-8.4 | -8.35-6.52 | -7.27-7.75 | -10.9-8.66 | -8.72-7.64 | -6.71-7.77 | -6.42-7.26 | -8.71-5.33 | -7.96-4.22 | -5.3-9.24 | -6.22-7.79 | -5.55-6.45 | -5.38-2.6 | -5.3-5.59 | -4.78-11.36 | -4.81-7.87 | | | |
| Theta (255°) | -7.16-5.28 | -5.01-8.71 | -6.21-9.11 | -7.32-6.28 | -7.51-4.99 | -4.32-8.42 | -7.15-7.1 | -7.48-9.6 | -7.72-9.67 | -8.95-8.51 | -5.78-10.27 | -10.79-8.22 | -6.57-7.62 | -6.3-6.91 | -8.67-7.19 | -6.89-6.66 | -5.04-8.55 | -9.09-4.9 | -6.38-7.01 | -7.05-7.68 | -7.08-3.03 | -3.71-5.94 | -4.18-5.34 | -6.19-9.65 | |
| Theta (270°) | -8.16-9.83 | -1.43-7.75 | -7.23-7.85 | -7.41-7.9 | -4.86-4.98 | -8.76-6.75 | -7.8-8.1 | -8.06-9.43 | -7.31-7.93 | -7.2-9.18 | -6.9-8.34 | -7.22-6.64 | -6.65-8.26 | -7.6-2.4 | -6.86-7.66 | -7.79-6.84 | -7.71-7.79 | -9.01-5.96 | -7.71-8.81 | -8.82-8.28 | -7.11-8.82 | -6.04-6.18 | -4.64-7.02 | -4.95-5.55 | |
| Theta (285°) | -6.46-7.93 | -6.7-7.03 | -7.14-7.16 | -7.51-7.03 | -11.19-9.64 | -6.87-6.6 | -9.06-9.44 | -9.17-8.84 | -6.07-6.91 | -8.53-10.14 | -10.03-9.8 | -11.31-8.95 | -10.35-6.3 | -5.5-7.13 | -8.5-6.27 | -6.4-8.13 | -9.3-9.1 | -9.23-7.72 | -8.83-10.51 | -9.72-7.34 | -6.21-4.8 | -5.06-5.06 | -8.4-7.2 | -10.04-6.31 | |
| Theta (300°) | -5.9-9.74 | -11.72-9.24 | -7.42-7.9 | -7.24-7.9 | -7.98-7.1 | -6.15-6.74 | -9.24-7.11 | -6.21-8.64 | -11.29-11.45 | -10.72-9.94 | -8.51-7.59 | -6.86-7.55 | -8.19-6.47 | -7.15-8.43 | -8.57-7.16 | -6.13-5.55 | -5.35-6.04 | -6.05-4.7 | -6.01-7.25 | -6.95-8.61 | -7.21-6.43 | -3.48-3.89 | -5.43-7.86 | -7.91-5.87 | |
| Theta (315°) | -8.1-8.4 | -8.16-6.46 | -7.36-7.16 | -7.97-7.95 | -7.2-7.67 | -9.81-10.31 | -9.81-8.59 | -7.7-8.03 | -7.29-8.56 | -8.25-10.22 | -10.35-9.26 | -8.81-7.26 | -6.2-6.27 | -7.8-8.4 | -10.07-11.15 | -8.76-8.21 | -6.88-6.29 | -5.27-5 | -5-5.94 | -6.69-8.28 | -10.44-11.12 | -12.16-10.95 | -10.37-10.17 | -10.35-9.63 | |
| Theta (330°) | -4.93-4.25 | -4.76-7.42 | -5.01-4.9 | -5.71-7.04 | -7.38-8.54 | -8.87-9.74 | -9.64-9.84 | -9.81-9.34 | -8.34-7.84 | -8.24-8.27 | -8.38-7.5 | -7.03-6.34 | -6.3-7.2 | -6.27-6.21 | -6.61-8.02 | -8.71-9.62 | -10.02-11.15 | -11.64-11.45 | -10.23-9.24 | -8.98-8.01 | -8.01-8.12 | -7.13-6.28 | -7.18-7.27 | -6.18-6.07 | |
| Theta (345°) | -11.77-12.12 | -12.31-12.43 | -10.17-12.14 | -11.97-11.45 | -11.36-10.62 | -10.10-10.39 | -11.65-11.07 | -10.48-10.15 | -9.61-10.99 | -11.35-11.79 | -11.35-11.84 | -12.09-11.66 | -11.92-11.77 | -11.88-11.18 | -12.31-11.72 | -12.01-12.03 | -11.64-11.13 | -10.75-10.98 | -11.55-10.12 | -10.33-11.66 | -12.05-11.33 | -11.59-11.14 | -11.59-12.34 | | |
| Theta (360°) | -11.15-11.22 | -11.81-12.1 | -11.99-10.53 | -9.37-8.84 | -8.26-8.36 | -7.52-7.65 | -8.88-8.56 | -8.21-8.98 | -9.9-10.4 | -11.29-11.83 | -12.04-11.52 | -10.57-9.16 | -8.93-8.05 | -7.82-7.85 | -8.15-7.83 | -7.4-7.51 | -6.89-7.31 | -7.42-7.27 | -7.15-8.15 | -9.39-9.56 | -10.04-9.3 | -9.96-10.19 | -8.68-9.12 | -9.15-8.97 | |
| Theta (15°) | -4.47-4.47 | -3.29-4.29 | -4.43-5.41 | -5.01-5.87 | -5.76-4.8 | -5.02-5.86 | -7.09-7.38 | -7.56-7.63 | -8.88-8.54 | -7.66-7.32 | -8.1-9.54 | -9.32-10.75 | -10.93-9.65 | -10.73-9.05 | -9.09-7.51 | -5.55-3.94 | -3.85-3.12 | -3.63-4.47 | -4.42-5.12 | -4.15-3.38 | -3.6-2.8 | -2.88-4.39 | -3.65-6.41 | -5.34-5.09 | |
| Theta (30°) | 1.510-5.2 | 0.24-0.32 | -0.81-1.22 | -0.86-2.06 | -2.56-2.57 | -2.39-3.5 | -4.64-3.64 | -3.11-2.65 | -2.5-2.54 | -2.16-2.17 | -2.27-1.9 | -1.53-2.16 | -3.22-1.87 | -1.78-2.21 | -2.42-3.07 | -0.480-25 | 0.36-0.58 | -0.56-0.96 | -0.190-19 | 0.29-0.45 | -0.310-37 | -0.13-0.13 | -0.82-0.78 | 0.020-75 | |
| Theta (45°) | 2.321-85 | 0.66-0.09 | 0.94-1.39 | 1.130-4.7 | 1.020-96 | 0.710-79 | 0.441-58 | 1.220-04 | -0.18-1.82 | -1.84-0.4 | -0.390-89 | 0.660-87 | 1.221-32 | 0.660-34 | -1.760-65 | 1.720-71 | 1.132-01 | 2.252-48 | 1.471-83 | 1.471-03 | 0.4-0.32 | 1.320-16 | 1.171-31 | 0.571-14 | |
| Theta (60°) | 0.981-14 | 0.591-61 | 1.62-0.24 | 0.761-16 | 0.621-59 | 1.382-34 | 1.610-65 | 1.180-44 | 1.360-96 | 0.921-14 | 1.461-43 | 1.442-69 | 2.092-23 | 2.163-01 | 1.931-5 | 1.771-95 | 3.582-07 | 2.593-37 | 2.242-41 | 2.910-29 | -0.340-58 | 0.69-1.51 | -0.280-93 | 0.470-15 | |
| Theta (75°) | 1.931-83 | 1.64-1.2 | 0.050-86 | -0.75-2.5 | -3.26-0.08 | -1.550-67 | 0.16-0.87 | 0.440-78 | 1.550-3 | 2.491-97 | 0.752-35 | 1.942-02 | 1.181-82 | 2.792-26 | -0.251-56 | 0.711-03 | 2.821-48 | 1.611-62 | 2.162-8 | 1.420-97 | 2.011-56 | 1.151-28 | 2.082-34 | 3.082-85 | |
| Theta (90°) | 3.42-9 | 1.752-08 | 1.090-12 | 0.73-1.52 | 0.170-77 | -1.491-78 | 0.541-53 | 1.310-96 | -0.01-1.49 | -1.650-2 | 1.521-38 | -0.360-67 | 1.592-23 | 0.080-84 | -0.89-1.5 | 0.310-33 | 0.310-91 | 0.291-05 | -0.571-124 | 0.65-1.29 | 0.05-0.87 | -0.16-0.18 | 1.522-65 | 2.472-75 | |
| Theta (105°) | -6.91-2.8 | -6.69-6.64 | -5.36-6.43 | -2.36-0.82 | 0.362-16 | 1.772-78 | 3.033-55 | 2.160-33 | 1.220-15 | -0.890-79 | 0.130-96 | 1.131-42 | 1.371-171 | 0.531-14 | -1.2-8.84 | -3.69-5.24 | -7.36-4.67 | -3.89-6.67 | -6.2-7.07 | -3.78-7.41 | -5.89-9.54 | -1.57-2.62 | -1.71-4.67</ | | |



Radiated Composite Gain Data of 6GHz

Appendix B

Gain Result

| Freq(Hz) | 6.175GPol. | PhiAnt. 1 | 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°) | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|
| 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(°) | 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°) |
| 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(°) | 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°) |



Radiated Composite Gain Data of 6GHz

Appendix B

| Theta (°) | -18.31-17.14 | -17.41-19.31 | -14.33-12.45 | -12.52-19.09 | -18.05-19.19 | -18.54-19.12 | -18.95-18.78 | -18.45-17.24 | -17.81-17.64 | -18.37-18.74 | -17.85-18.31 | -17.61-18.2 | -18.71-16.48 | -16.31-15.17 | -18.2-19.23 | -18.32-18.94 | -18.01-28 | -19.15-17.28 | -15.58-18.69 | -18.38-19.15 | -18.66-18.92 | -18.23-18.75 | -18.29-18 | -17.71-18.49 |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Theta (30°) | -15.69-15.79 | -14.45-14.57 | -19.03-14.11 | -16.96-17.89 | -15.75-19.19 | -18.61-18.74 | -18.62-17.48 | -18.82-19.3 | -18.11-19.04 | -19.02-17.37 | -13.97-17.2 | -18.82-17.2 | -16.07-13.44 | -17.02-18.07 | -18.82-19.23 | -18.41-18.62 | -17.94-18.29 | -18.13-18.79 | -17.51-18.25 | -18.77-18.13 | -14.92-18.05 | -17.08-17.47 | -18.11-18.75 | -18.46-17.87 |
| Theta (45°) | -18.64-16.91 | -11.86-14.43 | -14.43-12.55 | -15.26-17.36 | -17.91-19.02 | -18.08-19.44 | -17.97-19.09 | -18.65-18.74 | -17.76-15.77 | -18.47-19.03 | -18.61-13.72 | -15.11-14.34 | -10.03-18.73 | -17.91-17.11 | -18.61-18.41 | -13.21-10.88 | -18.59-14.86 | -19.03-18.42 | -17.87-18.48 | -18.05-18.4 | -18.08-15.7 | -18.71-15.49 | -18.19-18.14 | -18.06-17.33 |
| Theta (60°) | -17.31-18.92 | -15.91-12.16 | -18.04-17.44 | -17.93-18.67 | -19.09-18.9 | -19.05-18.75 | -19.23-17.71 | -18.41-18.65 | -18.91-18.55 | -14.64-16.81 | -9.69-17.1 | -17.21-18.16 | -19.08-10.88 | -17.16-17.0 | -14.42-15.95 | -17.92-15.28 | -18.78-17.8 | -18.17-17.2 | -18.49-19.12 | -17.99-17.68 | -18.08-12.96 | -16.83-15.32 | -18.51-19.02 | |
| Theta (75°) | -18.21-18.72 | -15.84-15.06 | -18.41-18.44 | -17.92-17.85 | -18.51-18.62 | -18.89-18.26 | -18.37-18.5 | -18.23-18.65 | -17.82-17.32 | -16.75-16.45 | -14.76-19.01 | -15.75-10.95 | -18.43-14.15 | -19.24-9.2 | -14.53-12.42 | -12.21-16 | -14.47-17.55 | -14.61-18.17 | -18.99-17.74 | -18.39-17.91 | -18.39-18.1 | -16.69-14.59 | -16.58-18.16 | -18.47-19.18 |
| Theta (90°) | -17.39-18.97 | -18.57-14.25 | -11.43-17.83 | -17.76-18.05 | -18.33-18.46 | -15.35-19.01 | -17.36-14.14 | -18.52-17.06 | -18.21-19 | -13.55-18.21 | -14.19-9.56 | -11.76-9.77 | -13.57-18.2 | -11.98-19 | -14.02-10.74 | -15.05-15.33 | -11.35-18.99 | -18.39-18.95 | -17.81-18.41 | -18.04-19.15 | -17.98-16.06 | -18.57-19.26 | -16.21-12.83 | -18.23-18.42 |
| Theta (105°) | -18.73-18.67 | -18.37-19.15 | -9.39-10.55 | -18.07-15.65 | -18.17-18.32 | -18.42-15.51 | -15.18-14.58 | -18.64-17.41 | -18.68-18.08 | -17.95-14.71 | -8.91-10.1 | -9.29-8.9 | -16.59-16.59 | -16.75-17.67 | -11.71-17.83 | -14.36-9.79 | -18.82-17.93 | -17.83-18.11 | -17.57-17.82 | -18.83-13.36 | -17.96-17.72 | -15.17-17.72 | -16.15-18.93 | -17.04-17.45 |
| Theta (120°) | -15.69-18.85 | -17.31-11.86 | -9.26-11.48 | -17.79-18.89 | -14.27-16.64 | -14.81-16.73 | -11.68-16.11 | -16.23-17.91 | -17.54-18.35 | -15.61-16.92 | -9.41-10.1 | -10.03-9.14 | -16.89-17.41 | -17.61-18.18 | -16.35-17.97 | -13.62-13.62 | -18.09-16.96 | -18.01-17.66 | -18.09-16.96 | -18.71-18.92 | -17.81-16.99 | -18.42-18.91 | -14.54-17.71 | -17.91-21 |
| Theta (135°) | -14.27-18.11 | -15.74-13.81 | -11.19-16.78 | -19.15-18.18 | -18.09-12.38 | -12.31-14.28 | -17.13-13.32 | -17.73-18.69 | -19.21-18.46 | -18.57-16.11 | -10.82-13.45 | -16.15-16.56 | -18.45-18.05 | -17.91-15.23 | -16.61-17.72 | -17.31-14.18 | -19.31-16.73 | -18.79-18.42 | -19.07-18.06 | -17.93-18.27 | -17.99-17.38 | -16.07-12.69 | -15.83-17.42 | -17.44-17.83 |
| Theta (150°) | -14.87-18.57 | -17.91-18.08 | -16.24-18.62 | -19.26-15.96 | -16.49-15.12 | -17.28-15.83 | -17.31-17.93 | -18.96-18.46 | -18.81-14.1 | -18.24-12.19 | -12.35-18.78 | -15.76-17.78 | -18.87-17.31 | -17.64-12.72 | -15.14-19 | -18.61-13.38 | -17.71-19.28 | -17.17-18.37 | -18.58-17.23 | -15.74-19.41 | -12.89-15.56 | -13.33-10.65 | -19.14-18.68 | |
| Theta (165°) | -16.59-17.3 | -16.83-18.72 | -11.64-18.18 | -19.78-10.83 | -13.36-17.85 | -17.59-17.27 | -17.79-19.02 | -14.01-18.25 | -18.47-15.87 | -18.34-14.26 | -14.08-13.06 | -12.85-15.33 | -17.87-13.78 | -18.65-18.75 | -13.91-18.2 | -17.68-13.14 | -14.46-15.84 | -14.58-18.9 | -18.34-18.36 | -14.61-17.97 | -18.76-18.15 | -13.41-10.25 | -17.44-15.81 | -14.54-14.85 |
| Theta (180°) | -17.18-18.86 | -18.09-14.64 | -17.36-18.18 | -18.29-10.68 | -14.09-18.53 | -17.33-18.23 | -17.66-18.48 | -18.91-17.72 | -19.11-17.89 | -15.16-11.71 | -11.86-18.15 | -11.61-17.71 | -16.75-14.45 | -19.01-18.12 | -8.93-13.42 | -18.82-10.71 | -11.75-16.07 | -15.25-17.96 | -18.81-17.3 | -18.28-12.45 | -7.59-15.27 | -11.12-10.71 | -18.37-18.28 | -17.33-17.2 |
| Theta (20°) | -18.71-18.94 | -19.31-17.92 | -19.12-18.66 | -16.31-12.89 | -12.26-18.66 | -14.14-19.4 | -18.92-18.15 | -18.24-17.38 | -17.41-11.77 | -18.24-15.43 | -12.78-12.53 | -14.11-10.49 | -18.71-15.72 | -17.91-17.97 | -16.27-17.62 | -17.64-13.16 | -18.66-11.89 | -16.79-18.2 | -6.96-11.86 | -17.39-11.82 | -13.12-18.78 | -18.71-18.78 | | |
| Theta (25°) | -18.84-18.53 | -17.57-14.92 | -16.98-18.76 | -15.93-11.89 | -17.43-11.2 | -13.48-12.67 | -14.87-18.12 | -14.25-15.88 | -18.29-12.6 | -17.09-17.66 | -18.68-10.71 | -10.04-12.22 | -11.59-15.15 | -18.09-14.17 | -14.45-16.96 | -9.94-12.63 | -16.01-18.23 | -18.94-17.1 | -18.81-8.47 | -18.58-18.67 | -9.16-9.77 | -17.34-19.32 | -14.72-13.54 | -18.81-18.07 |
| Theta (30°) | -18.06-17.64 | -17.74-15.91 | -14.44-15.14 | -11.25-9.4 | -11.71-12.32 | -8.97-14.04 | -11.41-12.33 | -16.53-13.32 | -16.91-16.43 | -17.94-13.19 | -17.99-17.81 | -12.22-17.53 | -13.23-16.13 | -15.61-14.44 | -19.11-14.35 | -18.43-19.1 | -18.92-14.92 | -18.22-18.67 | -17.98-15.63 | -16.01-17.85 | -15.84-7.36 | -12.46-18.4 | -17.88-18.26 | -16.63-19.31 |
| Theta (35°) | -15.51-15.22 | -18.21-12.28 | -9.58-12.47 | -12.02-10.26 | -12.18-8.43 | -6.69-10.41 | -12.97-9.63 | -13.29-15.06 | -17.23-12.26 | -15.22-15.77 | -11.53-17.58 | -18.68-17.82 | -16.07-15.44 | -18.91-15.08 | -18.02-11.4 | -16.03-14.34 | -14.33-14.14 | -17.67-17.92 | -15.98-11.59 | -18.83-17.66 | -18.98-13.3 | -10.22-14.13 | -18.22-15.2 | -18.27-17.12 |
| Theta (40°) | -18.89-18.73 | -19.04-18.38 | -17.41-11.97 | -10.15-12.55 | -10.81-9.15 | -8.78-8.28 | -14.71-17.9 | -11.31-15.92 | -15.04-18.6 | -11.47-12.15 | -11.41-18.56 | -18.36-17.37 | -18.08-19.34 | -19.78-15.06 | -18.61-17.96 | -14.37-14.37 | -13.06-14.01 | -10.48-13.71 | -14.68-17.28 | -12.47-16.55 | -14.81-14.43 | -18.45-17.97 | -19.31-19.85 | |
| Theta (45°) | -18.69-18.6 | -14.53-9.01 | -11.64-13.66 | -14.51-10.13 | -14.55-12.7 | -9.34-9.3 | -10.12-13.82 | -17.81-16.74 | -12.91-12.4 | -16.06-18.28 | -18.25-18.32 | -18.68-17.34 | -18.31-18.34 | -13.74-15.55 | -17.15-6.88 | -13.51-11.82 | -11.56-12.85 | -13.61-13.16 | -16.18-15.37 | -15.55-17.66 | -19.66-16.22 | -18.09-17.97 | -16.11-12.9 | -13.93-19.45 |
| Theta (50°) | -17.09-17.9 | -18.21-19.16 | -12.91-13.63 | -10.23-14.12 | -12.39-10.2 | -10.73-13.23 | -17.64-9.55 | -8.79-13 | -18.94-19.33 | -18.71-18.78 | -17.64-18.33 | -17.04-18.27 | -18.74-16.58 | -18.22-19.12 | -19.17-15.12 | -12.94-16.34 | -18.69-14.74 | -19.05-18.12 | -14.37-14.7 | -17.41-16.36 | -19.11-18.72 | -18.15-18.62 | -16.55-17.91 | -18.45-17.37 |
| Theta (55°) | -18.55-15.65 | -18.28-13.49 | -16.97-13.29 | -14.12-11.69 | -11.51-12.67 | -14.16-12.24 | -14.41-13.75 | -14.76-15.11 | -17.38-18 | -17.86-17.75 | -18.56-17.91 | -18.78-18.52 | -18.35-19.09 | -18.38-18.81 | -18.34-18.6 | -17.69-17.79 | -14.37-16.6 | -13.76-14.01 | -14.01-14.11 | -15.79-17.37 | -18.83-18.65 | -17.71-14.08 | -13.64-14.73 | -16.04-14.64 |
| Theta (60°) | -14.28-12.8 | -12.52-11.73 | -11.74-10.16 | -11.55-13.42 | -12.41-14.29 | -12.82-15.69 | -17.68-19.06 | -17.34-19.09 | -18.49-18.21 | -15.61-15.38 | -17.53-19.32 | -18.75-13.56 | -15.94-17.56 | -18.84-18.89 | -18.81-19.19 | -17.76-18.45 | -17.58-17.67 | -16.34-14.65 | -11.95-9.91 | -10.19-10.03 | -10.72-11.9 | -12.84-12.34 | -14.72-15.03 | -13.44-15.32 |
| Theta (65°) | -17.89-18.29 | -17.61-18.37 | -19.12-18.51 | -17.79-18.78 | -18.47-18.44 | -17.35-17.84 | -17.88-17.94 | -16.54-13.25 | -15.36-18.83 | -17.77-17.19 | -17.72-16.61 | -18.88-19.07 | -17.96-18.06 | -19.21-18.92 | -17.94-18.05 | -18.19-18.92 | -19.42-18.55 | -19.14-17.28 | -18.74-18.54 | -17.94-18.1 | -17.71-18.05 | -18.73-17.57 | -18.63-17.1 | -18.88-19.31 |
| Theta (70°) | -18.68-18.86 | -18.64-18.1 | -18.97-17.62 | -18.88-17.28 | -18.76-18.42 | -18.73-17.74 | -18.05-18.9 | -18.27-17.87 | -19.18-18.46 | -18.32-18.98 | -18.96-17.65 | -16.05-15.44 | -15.22-14.03 | -16.82-18.94 | -17.41-19.11 | -19.63-18.93 | -17.58-18.96 | -17.18-18.15 | -19.63-18.93 | -17.66-15.02 | -13.98-11.77 | -12.26-12.14 | -11.86-12.92 | -11.41-14.99 |
| Theta (75°) | -12.61-15.42 | -14.01-15.42 | -14.13-10.31 | -13.16-12.53 | -11.18-12.48 | -17.78-17.12 | -16.58-14.75 | -14.75-14.06 | -14.62-14.53 | -18.15-18.99 | -17.91-18.96 | -14.26-15.56 | -18.37-14.99 | -16.39-14.37 | -13.89-12.54 | -11.23-9.42 | -9.17-9.67 | -8.36-9.38 | -9.71-10.95 | -8.73-9.22 | -11.59-10.77 | -9.33-9.29 | -9.93-13.96 | -13.55-13.35 |
| Theta (80°) | -6.67-7.84 | -7.99-9.47 | -8.89-11.07 | -10.31-9.56 | -12.54-9.07 | -9.71-10.8 | -12.15-8.61 | -9.28-11.7 | -9.51-6.62 | -6.11-6.77 | -7.87-9.5 | -10.07-9.77 | -10.08-6.68 | -6.76-5.4 | -5.03-6.49 | -4.64-5 | -5.39-8.41 | -6.62-6.35 | -5.66-5.98 | -6.64-8.78 | -7.9-6 | -7.54-9.52 | -9.27-7.08 | -5.86-5.46 |
| Theta (85°) | -4.78-7.73 | -7.06-7.66 | -6.47-8.1 | -4.33-6.55 | -6.82-6.68 | -8.31-5.23 | -7.34-6.46 | -4.87-1.12 | -5.68-6.21 | -6.79-4.37 | -4.06-4.44 | -4.91-3.05 | -2.86-4.4 | -3.97-6.24 | -3.41-7 | -4.79-3.29 | -4.28-5.25 | -5.61-4.09 | -4.43-3.71 | -5.58-5.32 | -5.65-4.63 | -3.92-4.43 | -4.94-4.27 | |
| Theta (90°) | -2.81-2.11 | -2.46-3.05 | -3.16-5.62 | -5.28-3.39 | -6.56-3.92 | -4.64-5.17 | -5.78-5.96 | -4.49-4.32 | -4.55-6.66 | -3.84-5.13 | -3.79-6.84 | -4.68-5.47 | -7.2-4.83 | -6.11-9.21 | -1.51-5.83 | -5.82-6.49 | -4.97-2.87 | -4.64-2.08 | -2.47-1.5 | -3.17-3.27 | -3.16-7.65 | -2.43-4.29 | -5.34-2.52 | -2.21-3.84 |
| Theta (95°) | -3.37-3.55 | -4.48-5.14 | -3.79-4.08 | -1.57-4.66 | -3.81-2.58 | -7.21-2.99 | -3.41-4.85 | -4.47-4.58 | -3.89-6.18 | -6.52-3.74 | -9.08-4.76 | -13.21-10.22 | -14.06-13.35 | -8.97-7.94 | -10.95-11.69 | -9.17-9.5 | -7.91-2.99 | -5.87-3.86 | -5.01-1.17 | -3.92-2.98 | -1.44-5.42 | -4.35-3.01 | -5.05-5.81 | -2.27-1.02 |
| Theta (100°) | -6.37-3.57 | -4.51-4.3 | -3.11-4.89 | -5.03-4.06 | -4.28-2.97 | -4.17-1.96 | -3.44-4.55 | -3.94-5.85 | -7.11-9.94 | -10.71-11.2 | -5.33-12.4 | -7.54-13.27 | -6.74-5.06 | -6.76-8.35 | -10.51-10.11 | -6.11-19.6 | -6.45-5.71 | -4.91-10.07 | -6.65-10.69 | -7.04-9.37 | -4.33-3.36 | -7.63-10.53 | -5.35-5.05 | -6.65-6.55 |
| Theta (105°) | -19.74-5.59 | -9.17-11.04 | -9.79-12.44 | -7.06-9.53 | -10.34-6.12 | -4.06-5.35 | -6.63-4.75 | -6.56-7.84 | -3.51-11.05 | -9.43-7.84 | -7.07-1.96 | -2.08-3.73 | -3.58-6.55 | -3.83-6.47 | -8.08-8.04 | -8.19-17.36 | -12.15-16.82 | -10.78-9.6 | -15.84-11.27 | -18.59-18.93 | - | | | |

