



Antenna Composite Gain Test Report

| | |
|-----------------|---|
| Equipment | Wi-Fi AP |
| Brand Name | Quantum FIBER |
| Model Name | Q9500WK |
| Applicant | Gemtek Technology Co., Ltd. No. 15-1 Zhonghua Road, Hsinchu Industrial Park, Hukou, Hsinchu, Taiwan, 30352. |
| Manufacturer | Gemtek Technology Co., Ltd. No. 15-1 Zhonghua Road, Hsinchu Industrial Park, Hukou, Hsinchu, Taiwan, 30352. |
| Sample Received | Jul. 21, 2022 |
| Start Test Date | Jul. 26, 2022 |
| Final Test Date | Jul. 26, 2022 |



Table of Contents

| | |
|---|----|
| History of this test report..... | 3 |
| 1. Operation Mode and Antenna Information | 4 |
| 2. Test Frequency | 4 |
| 3. Testing Location..... | 4 |
| 4. Test Facility and Configuration..... | 5 |
| 5. Reference Calibration | 6 |
| 6. Test Method | 7 |
| 7. Measured Values and Calculation of Maximum Gain Positions..... | 8 |
| 8. Summary of Test Result | 10 |
| 9. Test Setup | 11 |
| 10. Test Equipment and Calibration Data | 12 |
| 11. Test Results | 13 |



History of this test report

| Report No. | Version | Description | Issued Date |
|------------|---------|--|---------------|
| AP272121 | 01 | Initial issue of report | Aug. 18, 2022 |
| AP272121 | 02 | remove the photographs to a separate exhibit This report is the latest version replacing for the report issued on Aug. 18, 2022 | Aug. 22, 2022 |
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1. Operation Mode and Antenna Information

| Antenna Position | RF Port | Brand Name | Model Name | Ant. Type | Connector | Modes of Operation |
|------------------|---------|------------|-----------------|-----------|-------------|--------------------|
| 2G5GL Ant1 | 1 | Lynwave | MEX22M-222AA1-A | PIFA | I-PEX / UFL | 2.4GHz, 5GHz |
| 2G5GL Ant2 | 2 | Lynwave | MEX22M-222AA1-A | PIFA | I-PEX / UFL | 2.4GHz, 5GHz |
| 5GH Ant1 | 1 | Lynwave | MEX22M-222AA1-A | PIFA | I-PEX / UFL | 5GHz |
| 5GH Ant2 | 2 | Lynwave | MEX22M-222AA1-A | PIFA | I-PEX / UFL | 5GHz |
| 5GH Ant3 | 3 | Lynwave | MEX22M-222AA1-A | PIFA | I-PEX / UFL | 5GHz |
| 5GH Ant4 | 4 | Lynwave | MEX22M-222AA1-A | PIFA | I-PEX / UFL | 5GHz |

Note:

2.4GHz and 5GHz Operation Mode (2TX/2RX)

2G5GL Ant1~ 2G5GL Ant2 could transmit/receive simultaneously.

5GHz Operation Mode (4TX/4RX)

5GH Ant1~ 5GH Ant4 could transmit/receive simultaneously.

2. Test Frequency

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

| Band [MHz] | Test Frequency [MHz] |
|-------------|----------------------|
| 2400-2483.5 | 2450 |
| 5150-5250 | 5200 |
| 5250-5350 | 5300 |
| 5470-5725 | 5600 |
| 5725-5850 | 5785 |

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 | Test Date |
| Radiated | 05CH03-HY | Rex Liao | 23.5~24.5°C / 40~50% | 26/Jul/2022 |

Note:

Testing Site Information

Brand Name: TDK

Dimension: 11m*6m*6m

Characteristic: Fully Anechoic Chamber

4. Test Facility and Configuration

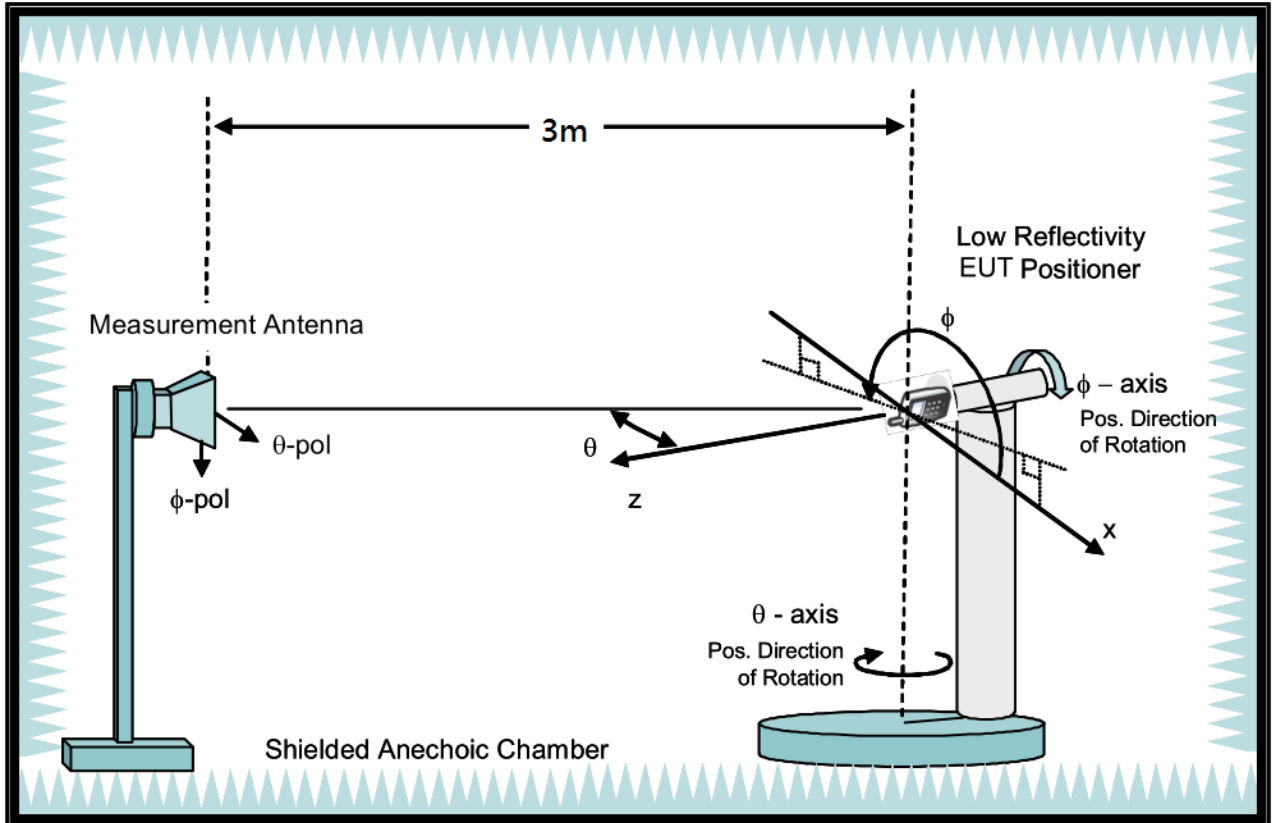
Test configuration: Reference to CITA OTA distributed-axes system configuration.

Chamber: Fully Anechoic Chamber.

Measurement antenna: Dual Polarization Horn antenna

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

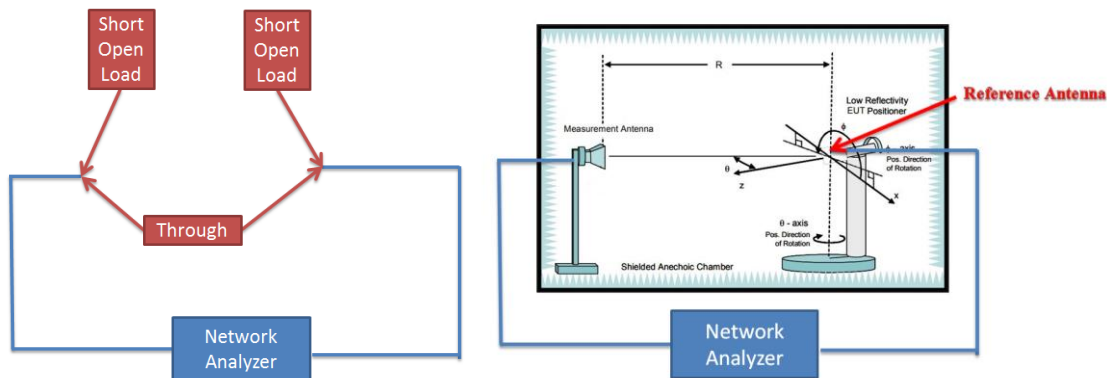
#Reference to CTIA “ctia-test-plan-for-wireless-device-over-the-air-performance-ver-3-7-1”



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 | 7500 |
| G reading (dB) | -31.4 | -31.4 | -31.3 | -31.3 | -31 | -30.7 | -30.1 | -30.5 | -30.5 | -30.8 | -31.3 | -32.8 | -34.4 | -35.4 |
| Reference gain (dBi) | 10.2 | 10.4 | 10.6 | 12.4 | 12.8 | 13.4 | 13.4 | 13.3 | 13.3 | 13.1 | 13.2 | 12.3 | 11.7 | 11.1 |
| Factor (dB) | 41.34 | 41.55 | 41.68 | 43.24 | 43.56 | 43.68 | 43.79 | 43.91 | 43.99 | 44.43 | 44.49 | 45.24 | 46.12 | 46.31 |

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 10 degree from 0 to 350 degree on Phi angle and 0 to 180 on theta angle of multi-axis positioner. Then set measurement antenna to theta polarization and repeat process. Repeat process to each antenna of EUT.

DG steps:

1. Each Phi and Theta polarization antenna gain are measured for all test angles.
2. Composite Phi and Theta antenna gain are computed, using formula in KDB662911 D01 d) (i) and e) (ii), for all angles.
3. Composite antenna gain are examined for all angles to determine max gain and Phi/Theta position. Max gain and phi/theta position are listed in section 7 tables.

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



7. Measured Values and Calculation of Maximum Gain Positions

DG_1SS max value position

| Frequency (Hz) | 2.45G | 5.2G | 5.3G |
|--------------------|-------|-------|-------|
| Ant. 1 (dBi) | -3.19 | -2.9 | -3.41 |
| Ant. 2 (dBi) | 2.13 | 2.42 | 2.58 |
| DG [1SS] (dBi) | 2.88 | 3.17 | 3.1 |
| Polarization | Theta | Theta | Theta |
| $\Theta(^{\circ})$ | 70 | 70 | 70 |
| $\Phi(^{\circ})$ | 260 | 120 | 180 |

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

DG_1SS max value position calculation

| Frequency (Hz) | 2.45G | 5.2G | 5.3G |
|--------------------------------|-------------------|------------------|-------------------|
| Ant. 1 [$10^{(G/20)}$] | $10^{(-3.19/20)}$ | $10^{(-2.9/20)}$ | $10^{(-3.41/20)}$ |
| Ant. 2 [$10^{(G/20)}$] | $10^{(2.13/20)}$ | $10^{(2.42/20)}$ | $10^{(2.58/20)}$ |
| Ant. 1 [$10^{(G/20)}$] value | 0.693 | 0.716 | 0.675 |
| Ant. 2 [$10^{(G/20)}$] value | 1.278 | 1.321 | 1.346 |
| Sum All Antenna [Amax] | 1.971 | 2.037 | 2.021 |
| DG [$10*\log(Amax^2/Nant)$] | 2.88 | 3.17 | 3.1 |

Note:

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

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



DG_1SS max value position

| Frequency (Hz) | 5.6G | 5.785G |
|--------------------|-------|--------|
| Ant. 1 (dBi) | 0.13 | -0.98 |
| Ant. 2 (dBi) | -4.62 | -3.54 |
| Ant. 3 (dBi) | 0.03 | 0.45 |
| Ant. 4 (dBi) | -1.93 | -2.5 |
| DG [1SS] (dBi) | 4.63 | 4.51 |
| Polarization | Theta | Theta |
| $\Theta(^{\circ})$ | 80 | 40 |
| $\Phi(^{\circ})$ | 250 | 330 |

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

DG_1SS max value position calculation

| Frequency (Hz) | 5.6G | 5.785G |
|---|-------------------|-------------------|
| Ant. 1 [$10^{(G/20)}$] | $10^{(0.13/20)}$ | $10^{(-0.98/20)}$ |
| Ant. 2 [$10^{(G/20)}$] | $10^{(-4.62/20)}$ | $10^{(-3.54/20)}$ |
| Ant. 3 [$10^{(G/20)}$] | $10^{(0.03/20)}$ | $10^{(0.45/20)}$ |
| Ant. 4 [$10^{(G/20)}$] | $10^{(-1.93/20)}$ | $10^{(-2.5/20)}$ |
| Ant. 1 [$10^{(G/20)}$] value | 1.015 | 0.893 |
| Ant. 2 [$10^{(G/20)}$] value | 0.587 | 0.665 |
| Ant. 3 [$10^{(G/20)}$] value | 1.003 | 1.053 |
| Ant. 4 [$10^{(G/20)}$] value | 0.801 | 0.75 |
| Sum All Antenna [Amax] | 3.407 | 3.362 |
| DG [$10 \cdot \log(A_{max}^2/N_{ant})$] | 4.63 | 4.51 |

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

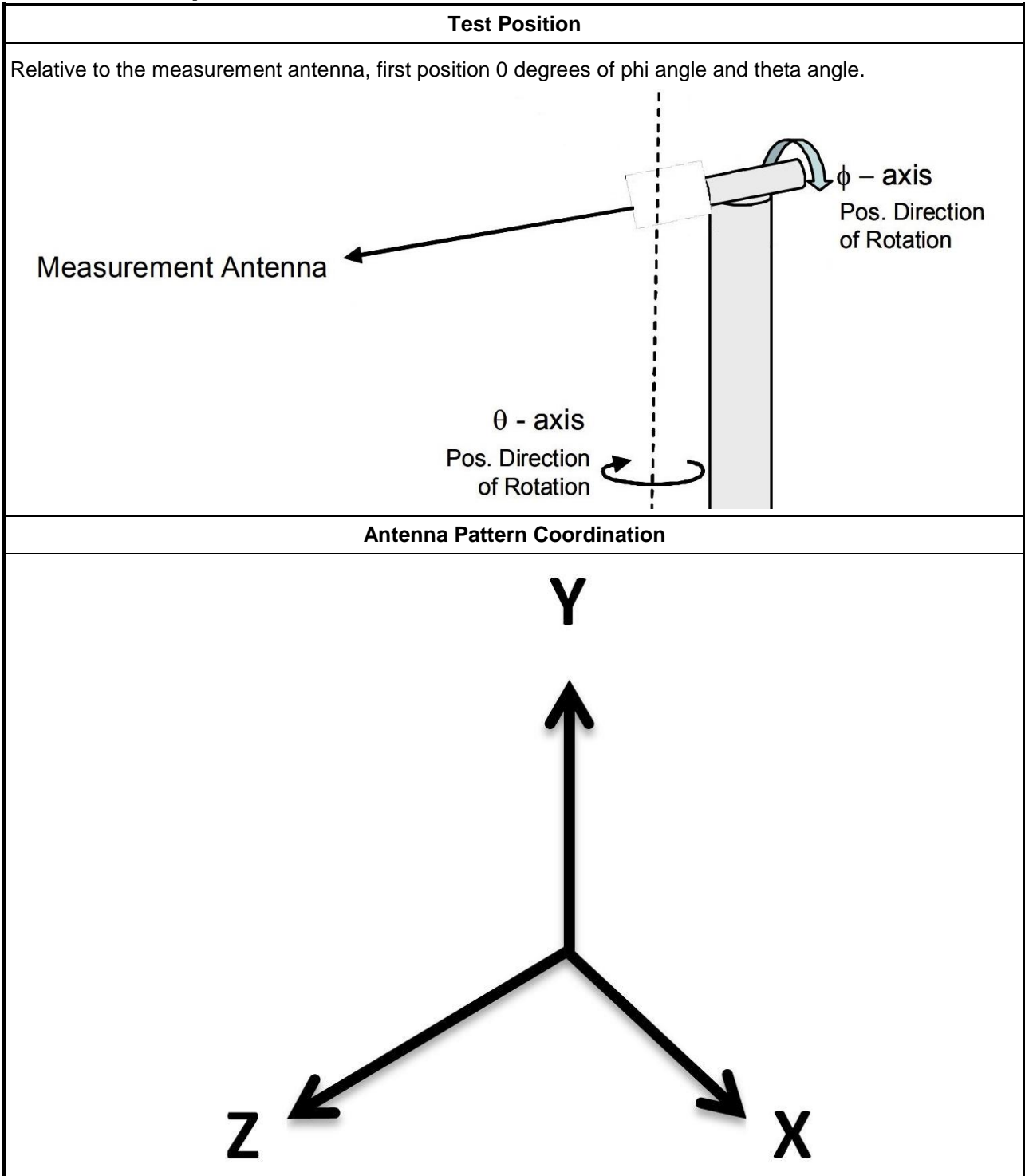
| Frequency (Hz) | 2.45G | 5.2G | 5.3G |
|-----------------------|--------------|--------------|---------------|
| Ant. 1 Max Gain (dBi) | 2.29 | 1.94 | 1.39 |
| Ant. 2 Max Gain (dBi) | 2.13 | 2.42 | 2.58 |
| Ant. 3 Max Gain (dBi) | Phi/150/170 | Theta/60/350 | Theta/120/190 |
| Max Gain (dBi) | Theta/70/260 | Theta/70/120 | Theta/70/180 |
| DG [1SS] (dBi) | 2.29 | 2.42 | 2.58 |
| DG [2SS] (dBi) | 2.88 | 3.17 | 3.1 |
| DG [3SS] (dBi) | 2.29 | 2.42 | 2.58 |

| Frequency (Hz) | 5.6G | 5.785G |
|---|--------------|--------------|
| Ant. 1 Max Gain (dBi) | 3.11 | 2.26 |
| Ant. 2 Max Gain (dBi) | 2.97 | 2.18 |
| Ant. 3 Max Gain (dBi) | 2.84 | 3.22 |
| Ant. 4 Max Gain (dBi) | 2.29 | 2.42 |
| Ant. 1 Polarization/ θ (°)/ Φ (°) | Theta/30/280 | Theta/50/270 |
| Ant. 2 Polarization/ θ (°)/ Φ (°) | Theta/90/40 | Theta/60/120 |
| Ant. 3 Polarization/ θ (°)/ Φ (°) | Theta/80/300 | Theta/80/320 |
| Max Gain (dBi) | 3.11 | 3.22 |
| DG [1SS] (dBi) | 4.63 | 4.51 |
| DG [2SS] (dBi) | 3.11 | 3.22 |
| DG [4SS] (dBi) | 3.11 | 3.22 |

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.
4. Directional Gain (4SS) = Directional Gain (1SS) – 6dB. If directional gain is less than max gain, use max gain as directional gain.

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-1292 | 1GHz~18GHz | Aug. 04, 2021 | Aug. 03, 2022 |
| Dual Polarization Horn Antenna | Sporton | S0209DP | S0209DP-001 | 2GHz~9GHz | N.C.R. | N.C.R. |
| ENA Series Network Analyzer | AGILENT | E5071C | MY46419201 | 100kHz~8.5GHz | Feb. 21, 2022 | Feb. 20, 2023 |
| 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 | V1.0.6 | - | N.C.R. | N.C.R. |

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

NCR means Non-Calibration required.



11. Test Results

Please refer to the appendix.

Appendix A. – Radiated Composite Gain of 2.4GHz& 5GHz (Low Band).....Page 14
Appendix B. – Radiated Composite Gain of 5GHz (High Band).....Page 20
Appendix C.1 – Antenna Pattern of 2.4GHz& 5GHz (Low Band).....Page 25
Appendix C.2 – Antenna Pattern of 5GHz (High Band)..... Page 28
Appendix D – Test Photos & Antenna Positon



| Freq(Hz) | 2.45G | 5.2G | 5.3G |
|--|--------------|--------------|---------------|
| Ant. 1 Max Gain (dBi) | 2.29 | 1.94 | 1.39 |
| Ant. 2 Max Gain (dBi) | 2.13 | 2.42 | 2.58 |
| Ant. 1 Polarization/ $\theta(^{\circ})/\phi(^{\circ})$ | Phi/150/170 | Theta/60/350 | Theta/120/190 |
| Ant. 2 Polarization/ $\theta(^{\circ})/\phi(^{\circ})$ | Theta/70/260 | Theta/70/120 | Theta/70/180 |
| Max Gain (dBi) | 2.29 | 2.42 | 2.58 |
| DG [1SS] (dBi) | 2.88 | 3.17 | 3.1 |
| DG [2SS] (dBi) | 2.29 | 2.42 | 2.58 |



Radiated Composite Gain Data

Appendix A

DG 1SS Result

Table with columns: Freq(Hz), 2.45G/Pol, Phi, and various Phi angles (Phi(0) to Phi(350)). Rows include DG(dB) and 5.3G/Pol data for angles from 0 to 180 degrees.



Radiated Composite Gain Data

Appendix A

| | | | | | | | | | | | | | | | | | | |
|---------|-------------|-------------|-------------|---------------|---------------|---------------|--------------|--------------|-------------|-------------|--------------|---------------|---------------|---------------|-------------|---------------|---------------|-------------|
| Θ(60°) | -0.63/-2.98 | -4.53/-3.24 | -1.67/-1.37 | -1.59/-1.19 | -2.48/-3.8 | -3.83/-3.46 | -4.4/-3.04 | -2.11/-2.4 | -1.35/0.4 | 1.22/-0.28 | -1.74/-3.63 | -4.13/-5.42 | -5.61/-3.84 | -1.27/0.08 | -0.03/-1.06 | -0.86/0.12 | -0.78/-1.89 | -0.77/-0.14 |
| Θ(70°) | -0.49/-1.62 | -3.53/-6.36 | -5.16/-3.54 | -1.82/-1.15 | -2.08/-4.97 | -3.25/-2.45 | -3.2/-2.43 | -1.35/0.07 | 1.23/2.89 | 3.11/2.7 | 0.74/-2.07 | -2.82/-2.3 | -4.58/-2.16 | 0.93/-0.03 | -0.29/-1.81 | -2.28/-1.95 | -4.32/-3.3 | -1.25/-0.22 |
| Θ(80°) | -0.77/-1.24 | -2.84/-6.16 | -6.57/-4.62 | -2.92/-2.01 | -2.31/-5.12 | -2.51/-1.32 | -2.25/-2.47 | -3.11/-2.98 | -0.95/1.34 | 2.19/-2.08 | -5.48/-6.97 | -6.09/-3.28 | -2.6/-0.61 | 0.24/-1.63 | -3.36/-4.43 | -7.23/-8.14 | -8.6/-6.62 | -3.15/-2.46 |
| Θ(90°) | -1.66/-1.97 | -3.4/-5.46 | -7.8/-6.16 | -3.54/-2.72 | -4.63/-4.55 | -1.29/-1.04 | -2.97/-1.89 | -2.73/-2 | -1.02/-0.3 | -0.8/-4.68 | -3.82/-6.03 | -5.6/-5 | -3.55/-0.94 | -2.86/-8.01 | -9.32/-5.46 | -8.21/-6.55 | -4.6/-2.64 | -3.08/-3.65 |
| Θ(100°) | -4.44/-3.68 | -5.88/-5 | -7.08/-5.65 | -5.16/-5.38 | -8.57/-4.18 | -0.64/-1.17 | -3.75/-3.46 | -3.98/-2.66 | -1.86/-2.17 | -6.8/-4.85 | -1.87/-2.29 | -5.23/-6.02 | -4.71/-8.36 | -7.33/-10.41 | -8.4/-7.05 | -4.12/-3.88 | -2.84/-2.37 | -4.72/-6.43 |
| Θ(110°) | -2.18/-2.54 | -5.26/-4.2 | -4.5/-3.73 | -8.81/-7.54 | -8.11/-6.02 | -2.58/-2.85 | -4.15/-6.58 | -4.53/-4.55 | -3.07/-4.76 | -5.69/-2.21 | -2.74/-4.65 | -4.9/-4.6 | -3.31/-10.49 | -8.13/-4.23 | -3.85/-5.29 | -2.38/-3.69 | -2.99/-5.08 | -5.36/-3.77 |
| Θ(120°) | -3.7/-2.97 | -5.1/-6.44 | -3.74/-5.15 | -7.6/-10.41 | -7.86/-7.14 | -5.09/-5.7 | -5.78/-4.71 | -4.4/-4.18 | -4.24/-1.56 | -0.25/1.01 | -1.43/-4.41 | -1.84/-2.42 | -4.58/-6.83 | -8.84/-6.36 | -3.47/-6.19 | -5.89/-2.98 | -4.88/-9.21 | -5.48/-0.46 |
| Θ(130°) | -1.69/-1.22 | -2.64/-4.41 | -4.24/-3.48 | -5.19/-7.82 | -6.48/-8.94 | -9.79/-6.69 | -5.11/-3.49 | -3.21/-3.59 | -4.11/-1.9 | -0.64/0.12 | -5.9/-7.54 | -3.72/-3.72 | -2.02/-3.96 | -6.5/-7.51 | -2.39/-8.4 | -7.61/-8.17 | -7.36/-4.56 | -2.64/0.04 |
| Θ(140°) | -3.36/-4.28 | -3.72/-7.49 | -5.62/-2.72 | -1.74/-2.37 | -2.6/-3.04 | -4.83/-5.15 | -2.35/-0.72 | -1.27/-2.27 | -4.14/-3.15 | -1.59/-2.98 | -3.57/-2.45 | -0.6/-4.06 | -1.87/-4.48 | -1.73/-0.96 | -2.31/-2.79 | -3.71/-5.66 | -1.87/-1.89 | -1.97/-1.86 |
| Θ(150°) | -4.59/-4.56 | -4.94/-4.91 | -2.75/-1.64 | -2.71/-5.51 | -8.9/-11.1 | -11.28/-7.92 | -5.1/-3.97 | -4.86/-5.45 | -6.43/-6.05 | -3.71/-2.39 | -2.14/-1.63 | -2.74/-5.32 | -8.74/-9.37 | -4.84/-4.8 | -3.47/-4.68 | -6.19/-5.41 | -3.18/-2.34 | -3.72/-4.9 |
| Θ(160°) | -5.05/-5.52 | -5.94/-6.2 | -5.44/-4.98 | -5.5/-8.45 | -10.36/-11.72 | -12.25/-11.92 | -11.4/-11.53 | -10.71/-8.17 | -7.15/-5.46 | -3.95/-3.5 | -3.59/-3.01 | -2.92/-4.26 | -10.27/-12.02 | -8.98/-9.46 | -9.49/-9.72 | -13.14/-15.07 | -12.84/-12.16 | -8.54/-6.31 |
| Θ(170°) | -6.05/-6.67 | -8.92/-11.3 | -9.77/-8.97 | -7.29/-6.92 | -6.73/-6.24 | -6.51/-8.23 | -8.95/-8.56 | -7.63/-6.98 | -5.86/-4.13 | -2.71/-2.67 | -3.56/-5.63 | -9.21/-11.82 | -10.36/-9.25 | -7.51/-6.94 | -7.96/-9.06 | -11.61/-13.45 | -12.34/-9.13 | -6.95/-5.62 |
| Θ(180°) | -5.06/-5.87 | -7.21/-7.17 | -8.11/-9.88 | -11.31/-11.95 | -14.12/-15.87 | -15.77/-13.51 | -10.99/-9.42 | -8.5/-7.3 | -6.89/-6.86 | -7.43/-9.02 | -9.76/-11.24 | -11.77/-12.35 | -12.91/-13.61 | -11.69/-11.17 | -10.7/-9.35 | -7.5/-6.02 | -5.48/-5.25 | -4.25/-4.23 |



Gain Result

Table with columns for Freq(Hz), Gain, and various Phi(Ant.) values. It contains multiple sub-tables for different frequencies and antenna configurations.



Radiated Composite Gain Data

Appendix A

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----------------|-----------------|-----------------|-----------------|-----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gain | Phi(0)*Phi(10) | Phi(20)*Phi(30) | Phi(40)*Phi(50) | Phi(60)*Phi(70) | Phi(80)*Phi(90) | Phi(100)*Phi(110) | Phi(120)*Phi(130) | Phi(140)*Phi(150) | Phi(160)*Phi(170) | Phi(180)*Phi(190) | Phi(200)*Phi(210) | Phi(220)*Phi(230) | Phi(240)*Phi(250) | Phi(260)*Phi(270) | Phi(280)*Phi(290) | Phi(300)*Phi(310) | Phi(320)*Phi(330) | Phi(340)*Phi(350) | | | | | | | | | | | | | | | | | | |
| Theta | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 | 230 | 240 | 250 | 260 | 270 | 280 | 290 | 300 | 310 | 320 | 330 | 340 | 350 |
| Gain | Phi(0)*Phi(10) | Phi(20)*Phi(30) | Phi(40)*Phi(50) | Phi(60)*Phi(70) | Phi(80)*Phi(90) | Phi(100)*Phi(110) | Phi(120)*Phi(130) | Phi(140)*Phi(150) | Phi(160)*Phi(170) | Phi(180)*Phi(190) | Phi(200)*Phi(210) | Phi(220)*Phi(230) | Phi(240)*Phi(250) | Phi(260)*Phi(270) | Phi(280)*Phi(290) | Phi(300)*Phi(310) | Phi(320)*Phi(330) | Phi(340)*Phi(350) | | | | | | | | | | | | | | | | | | |
| Theta | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 | 230 | 240 | 250 | 260 | 270 | 280 | 290 | 300 | 310 | 320 | 330 | 340 | 350 |
| Gain | Phi(0)*Phi(10) | Phi(20)*Phi(30) | Phi(40)*Phi(50) | Phi(60)*Phi(70) | Phi(80)*Phi(90) | Phi(100)*Phi(110) | Phi(120)*Phi(130) | Phi(140)*Phi(150) | Phi(160)*Phi(170) | Phi(180)*Phi(190) | Phi(200)*Phi(210) | Phi(220)*Phi(230) | Phi(240)*Phi(250) | Phi(260)*Phi(270) | Phi(280)*Phi(290) | Phi(300)*Phi(310) | Phi(320)*Phi(330) | Phi(340)*Phi(350) | | | | | | | | | | | | | | | | | | |
| Theta | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 | 230 | 240 | 250 | 260 | 270 | 280 | 290 | 300 | 310 | 320 | 330 | 340 | 350 |



Radiated Composite Gain Data

Appendix A

| Gain | $\Phi(0^\circ)/\Phi(10^\circ)$ | $\Phi(20^\circ)/\Phi(30^\circ)$ | $\Phi(40^\circ)/\Phi(50^\circ)$ | $\Phi(60^\circ)/\Phi(70^\circ)$ | $\Phi(80^\circ)/\Phi(90^\circ)$ | $\Phi(100^\circ)/\Phi(110^\circ)$ | $\Phi(120^\circ)/\Phi(130^\circ)$ | $\Phi(140^\circ)/\Phi(150^\circ)$ | $\Phi(160^\circ)/\Phi(170^\circ)$ | $\Phi(180^\circ)/\Phi(190^\circ)$ | $\Phi(200^\circ)/\Phi(210^\circ)$ | $\Phi(220^\circ)/\Phi(230^\circ)$ | $\Phi(240^\circ)/\Phi(250^\circ)$ | $\Phi(260^\circ)/\Phi(270^\circ)$ | $\Phi(280^\circ)/\Phi(290^\circ)$ | $\Phi(300^\circ)/\Phi(310^\circ)$ | $\Phi(320^\circ)/\Phi(330^\circ)$ | $\Phi(340^\circ)/\Phi(350^\circ)$ |
|---------------------|--------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| $\Theta(160^\circ)$ | -4.62/-6.32 | -6.52/-5.55 | -5.31/-4.57 | -4.52/-5.88 | -8.08/-11.26 | -11.26/-11.64 | -12.04/-13.16 | -14.42/-12.48 | -11.83/-15.06 | -18.94/-17.41 | -18.29/-18.97 | -17.68/-13.38 | -13.04/-13.06 | -13.54/-12.33 | -12.83/-9.38 | -5.79/-4.32 | -3.43/-2.94 | -3.14/-3.66 |
| $\Theta(170^\circ)$ | -11/-12.28 | -12/-10.99 | -12/-15.18 | -19.69/-16.76 | -16.91/-13.87 | -12.07/-10.68 | -10.25/-10.84 | -14.51/-16.97 | -14.68/-13.77 | -15.2/-18.1 | -18.55/-18.24 | -16.31/-15.49 | -15.04/-17.92 | -18.41/-18.32 | -16.9/-11.26 | -7.79/-6.52 | -6.4/-6.22 | -7.55/-9.22 |
| $\Theta(180^\circ)$ | -18.64/-16.34 | -13.64/-11.2 | -9.78/-10.11 | -10.16/-10.49 | -11.36/-12.74 | -15/-13.47 | -14.58/-16.12 | -17.84/-18.58 | -18.21/-15.99 | -14.4/-13.53 | -12.63/-12.12 | -11.48/-10.87 | -10.91/-11.05 | -11.95/-13.12 | -16.11/-18.78 | -18.07/-18.09 | -19.13/-18.29 | -18.42/-18.19 |
| Freq(Hz) | 5.3GHz | Theta/Ant 2 | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| $\Theta(10^\circ)$ | -5.19/-7.61 | -12.8/-18.83 | -19.47/-18.35 | -17.94/-15.1 | -12.28/-10.91 | -9.14/-8.18 | -8.07/-8.06 | -8.32/-8.02 | -8.41/-8.45 | -9.78/-9.86 | -8.04/-6.89 | -7.45/-8.33 | -8.95/-9.87 | -11.04/-12.49 | -12.09/-9.66 | -7.54/-5.78 | -5.45/-5.61 | -5.55/-4.81 |
| $\Theta(20^\circ)$ | -3.63/-4.67 | -7.24/-7.59 | -6.73/-5.79 | -6.03/-6.03 | -6.53/-7.47 | -9.39/-9.36 | -8.32/-7.18 | -6.89/-7.27 | -8.8/-9.05 | -8.37/-7.67 | -6.43/-5.8 | -5.47/-5.24 | -5.51/-6.33 | -8.43/-11.24 | -11.66/-10.57 | -9.29/-8.54 | -8.28/-7.16 | -5.61/-4.16 |
| $\Theta(30^\circ)$ | -2.77/-2.25 | -3.43/-3.34 | -2/-1.71 | -3.66/-5.81 | -5.5/-4.6 | -4.9/-7.41 | -6.7/-5.52 | -4.15/-3.82 | -5.03/-6.63 | -7.69/-7.52 | -7.88/-8.1 | -7.78/-8.14 | -7.47/-6.73 | -5.96/-7.1 | -10.85/-9.15 | -6.58/-7.24 | -7.77/-7.33 | -6.64/-4.56 |
| $\Theta(40^\circ)$ | -4.16/-3.54 | -3.43/-1.39 | 0.13/-0.02 | -2.3/-4.4 | -3.74/-2.79 | -3.94/-6.02 | -5.54/-3.51 | -3.27/-2.84 | -2.98/-4.19 | -6.09/-7.64 | -9.85/-16.42 | -19.03/-13.84 | -5.47/-3.12 | -3.09/-4.58 | -4.27/-4.74 | -4.6/-3.86 | -6.16/-7.28 | -8.92/-6.63 |
| $\Theta(50^\circ)$ | -4.08/-3.52 | -3.14/-1.01 | 0.17/-0.24 | -1.98/-3.32 | -2.59/-2.05 | -3.65/-6.37 | -7.3/-4.45 | -4.29/-4.78 | -3.13/-1.97 | -2.36/-3.39 | -5.21/-8.01 | -13.58/-18.7 | -7.66/-4.58 | -4.06/-4.6 | -5.03/-5.22 | -3.82/-4.35 | -5.76/-6.77 | -7.17/-5.22 |
| $\Theta(60^\circ)$ | -5.3/-5 | -3.85/-1.79 | -1.04/-1.89 | -3.34/-3.12 | -3.09/-5.16 | -6.68/-5.06 | -2.69/-2.68 | -3.98/-6.2 | -3.98/-0.77 | 0.63/-2 | -5.57/-9.84 | -10.49/-16.93 | -11.17/-6.25 | -4.91/-4.98 | -5.43/-6.26 | -6.36/-3.88 | -6.83/-7.25 | -8.58/-6.73 |
| $\Theta(70^\circ)$ | -4.63/-5.87 | -4.96/-4.93 | -4.21/-4.6 | -3.56/-2.39 | -3.27/-6.67 | -5.62/-4.08 | -2.02/-2.4 | -3.04/-2.14 | -0.32/-1.59 | 2.59/1.84 | 0.93/-2.62 | -4.1/-6.32 | -7.96/-4.48 | -3.98/-5.21 | -4.76/-6.79 | -8.4/-5.99 | -8.53/-8.45 | -6.87/-7.44 |
| $\Theta(80^\circ)$ | -4.64/-5.45 | -5.32/-8.05 | -5.78/-6.78 | -5.49/-4.62 | -6.09/-13.16 | -5.99/-3.17 | -2.62/-3.01 | -9.38/-12 | -5.51/-1.55 | 0.15/-2.06 | -5.89/-9.7 | -7.23/-3.81 | -3.08/-2.44 | -3.62/-5.49 | -5.94/-9.15 | -17.56/-12.34 | -10.54/-11.86 | -8.73/-8.39 |
| $\Theta(90^\circ)$ | -5.46/-4.88 | -6.94/-9.81 | -7.9/-8.71 | -6.44/-6.28 | -10.08/-11.6 | -5.91/-3.81 | -5.29/-5.45 | -12.71/-12.21 | -6.54/-4.72 | -4.11/-4.99 | -5.45/-6.88 | -6.07/-3.76 | -2.45/-3.06 | -5.02/-9.38 | -9.08/-8.56 | -14.44/-18.89 | -13.98/-9.54 | -8.62/-7.93 |
| $\Theta(100^\circ)$ | -5.4/-5.94 | -9.75/-8.15 | -7.2/-7.07 | -7.5/-11.91 | -16.7/-7.55 | -4.41/-5.55 | -8.42/-9.13 | -19.13/-14.63 | -7.72/-7.19 | -13.58/-6.74 | -5.46/-6.41 | -5.84/-5.57 | -5.68/-10.77 | -6.45/-10.72 | -12.91/-9.79 | -10.31/-18.49 | -15.89/-11.58 | -9.84/-7.05 |
| $\Theta(110^\circ)$ | -4.02/-6.55 | -8.57/-5.54 | -5.32/-5.79 | -9.99/-13.18 | -11.09/-6.37 | -6.57/-11.03 | -15.21/-18.21 | -18.35/-18.38 | -8.28/-9.24 | -18.96/-8.7 | -9.37/-13.87 | -7.33/-7.81 | -10.54/-14.21 | -7.28/-9.32 | -9.45/-9.27 | -8.99/-18.36 | -12.57/-17.12 | -7.22/-5.14 |
| $\Theta(120^\circ)$ | -5.21/-7.04 | -6.46/-5.1 | -5.62/-10.38 | -11.35/-10.49 | -7.41/-7.34 | -9.95/-18.11 | -17.7/-15.96 | -14.44/-19.02 | -16.69/-10.44 | -7.75/-7.62 | -13.54/-19.01 | -8.86/-10.44 | -13.03/-11.21 | -19.04/-14.3 | -10.15/-9.06 | -9.7/-18.25 | -10.3/-8.97 | -3.98/-2.03 |
| $\Theta(130^\circ)$ | -5.42/-4.03 | -5.11/-4.44 | -8.42/-9.45 | -7.79/-7.52 | -10.19/-16.25 | -18.66/-16.18 | -14.46/-10.63 | -11.34/-13.92 | -17.23/-13.08 | -8.45/-6.12 | -10.83/-14.57 | -4.19/-11.2 | -8.41/-6.49 | -10.18/-9.38 | -13.77/-18.55 | -14.6/-13.9 | -12.7/-6.36 | -4.98/-1.76 |
| $\Theta(140^\circ)$ | -6.13/-6.55 | -4.68/-9.39 | -17.7/-12.4 | -7.76/-5.81 | -6.43/-10.08 | -17.16/-15.12 | -8.66/-7.67 | -9.13/-10.31 | -19.17/-13.3 | -5.27/-6.64 | -4.15/-4.82 | -3.75/-5.31 | -4.03/-4 | -5.33/-5.79 | -13.96/-12.57 | -8.75/-8.49 | -2.87/-5.87 | -5.82/-4.59 |
| $\Theta(150^\circ)$ | -8.11/-8.26 | -10.81/-12.03 | -8.3/-5.91 | -6.3/-8.37 | -9.91/-11.02 | -11.39/-10.95 | -9.96/-7.32 | -6.76/-7.61 | -9.11/-11.49 | -12.32/-11.37 | -15.35/-14.21 | -10.06/-13.68 | -17.32/-8.95 | -7.25/-14.12 | -15.21/-15.49 | -12.16/-10.58 | -7.65/-5.66 | -8.12/-9.28 |
| $\Theta(160^\circ)$ | -5.6/-5.22 | -6.43/-9.21 | -9.23/-7.85 | -7.2/-8.53 | -10.91/-14.34 | -16.59/-16.68 | -14.11/-11.79 | -10.58/-10.26 | -14.32/-18.35 | -19.15/-18.76 | -18.53/-14.66 | -11.07/-9.49 | -11.61/-14.64 | -15.54/-18.12 | -18.83/-13.82 | -15.97/-18.18 | -16.11/-12.91 | -7.82/-7.35 |
| $\Theta(170^\circ)$ | -7.71/-9.6 | -11.84/-16.4 | -11.46/-9.57 | -7.87/-7.82 | -8.41/-8.43 | -8.51/-10.4 | -11.93/-13.74 | -15.4/-17.7 | -18.21/-15.65 | -10.86/-9.22 | -8.42/-8.73 | -10.21/-12.23 | -14.61/-18.39 | -18.09/-17.86 | -17.34/-14.85 | -17.44/-18.89 | -15.41/-10.22 | -8.31/-7.19 |
| $\Theta(180^\circ)$ | -6.94/-6.57 | -7.48/-6.58 | -7.2/-9.61 | -11.59/-12.71 | -16.07/-18.8 | -18.98/-17.63 | -14.9/-13.03 | -11.54/-10.41 | -10.13/-10.69 | -12.66/-16.17 | -17.51/-19.45 | -18.58/-17.96 | -18.43/-19.19 | -16.78/-16.45 | -14.47/-12.6 | -11.42/-10.85 | -12.21/-11.7 | -8.42/-7.46 |



| Freq(Hz) | 5.6G | 5.785G |
|---|--------------|--------------|
| Ant. 1 Max Gain (dBi) | 3.11 | 2.26 |
| Ant. 2 Max Gain (dBi) | 2.97 | 2.18 |
| Ant. 3 Max Gain (dBi) | 2.84 | 3.22 |
| Ant. 4 Max Gain (dBi) | 2.29 | 2.42 |
| Ant. 1 Polarization/ θ (°)/ ϕ (°) | Theta/30/280 | Theta/50/270 |
| Ant. 2 Polarization/ θ (°)/ ϕ (°) | Theta/90/40 | Theta/60/120 |
| Ant. 3 Polarization/ θ (°)/ ϕ (°) | Theta/80/300 | Theta/80/320 |
| Ant. 4 Polarization/ θ (°)/ ϕ (°) | Theta/60/200 | Theta/60/200 |
| Max Gain (dBi) | 3.11 | 3.22 |
| DG [1SS] (dBi) | 4.63 | 4.51 |
| DG [2SS] (dBi) | 3.11 | 3.22 |
| DG [4SS] (dBi) | 3.11 | 3.22 |



DG 1SS Result

Table with columns for Freq(Hz), 5.6GPol, Phi(-), and various Phi angles (0 to 350 degrees). Rows include DG(dB), Theta(0), and Theta(10) for multiple frequencies.



Radiated Composite Gain Data

Appendix B

Gain Result

| Freq(Hz) | 5.6GPol. | PhiAnt.1 | + | - | + | - | + | - | + | - | + | - | + | - | + | - | + | - |
|----------|---------------|----------------|----------------|----------------|----------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Gain | Phi(0)Phi(10) | Phi(20)Phi(30) | Phi(40)Phi(50) | Phi(60)Phi(70) | Phi(80)Phi(90) | Phi(100)Phi(110) | Phi(120)Phi(130) | Phi(140)Phi(150) | Phi(160)Phi(170) | Phi(180)Phi(190) | Phi(200)Phi(210) | Phi(220)Phi(230) | Phi(240)Phi(250) | Phi(260)Phi(270) | Phi(280)Phi(290) | Phi(300)Phi(310) | Phi(320)Phi(330) | Phi(340)Phi(350) |
| Theta(0) | -1.92/-1.66 | -2.05/-2.12 | -2.38/-3.24 | -3.31/-3.76 | -5.57/-7.12 | -11.09/-15.67 | -18.02/-12.34 | -2.42/-2.67 | -6.45/-4.08 | -2.73/-1.72 | -1.47/-1.71 | -19.08/-14.8 | -3.37/-4.07 | -5.05/-7.81 | -12.21/-17.54 | -19.08/-14.8 | -11.04/-7.09 | -4.17/-2.69 |



Radiated Composite Gain Data

Appendix B

| Theta | Phi(0°) | Phi(10°) | Phi(20°) | Phi(30°) | Phi(40°) | Phi(50°) | Phi(60°) | Phi(70°) | Phi(80°) | Phi(90°) | Phi(100°) | Phi(110°) | Phi(120°) | Phi(130°) | Phi(140°) | Phi(150°) | Phi(160°) | Phi(170°) | Phi(180°) | Phi(190°) | Phi(200°) | Phi(210°) | Phi(220°) | Phi(230°) | Phi(240°) | Phi(250°) | Phi(260°) | Phi(270°) | Phi(280°) | Phi(290°) | Phi(300°) | Phi(310°) | Phi(320°) | Phi(330°) | Phi(340°) | Phi(350°) | | |
|-----------|-------------|-------------|------------|-------------|-------------|-------------|-----------|------------|-------------|-------------|-------------|------------|-------------|-------------|-------------|------------|-------------|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--|--|
| Theta(0°) | -1.77/-0.91 | -0.320/1.41 | 0.810/9.88 | -0.18/-2.77 | -7.13/-6.38 | -2.77/-0.56 | 0.67/-0.2 | -2.97/-4.7 | -6.36/-7.84 | -6.41/-4.65 | -5.52/-1.41 | 0.62/-0.81 | -3.73/-6.18 | -6.16/-5.48 | -3.31/-1.77 | -1.2/-2.58 | -4.45/-5.84 | -3.19/-2.18 | | | | | | | | | | | | | | | | | | | | |



Antenna Pattern

Appendix C.1

| | | | | | | | | | | | | | | | | | | |
|---------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------|
| θ(60°) | -1.50/-0.47 | 0.20/0.57 | 0.29/-0.84 | -1.87/-0.95 | -1.12/-3.57 | -6.44/-3.64 | -1.25/-2.08 | -3.81/-5.72 | -3.36/-0.25 | 1.34/-0.67 | -4.95/-9.25 | -9.90/-13.31 | -9.52/-6.00 | -3.74/-2.62 | -2.08/-2.23 | -1.45/0.12 | -0.67/-1.96 | -3.56/-2.68 |
| θ(70°) | 0.34/0.48 | 0.36/-0.57 | -1.27/-2.27 | -1.79/-1.17 | -2.01/-5.20 | -5.40/-3.31 | -0.79/-1.13 | -2.08/-1.34 | 0.38/2.45 | 3.57/2.51 | 1.54/-1.45 | -3.07/-6.10 | -6.79/-3.59 | -2.79/-2.54 | -1.34/-1.21 | -1.76/-0.73 | -0.83/-2.07 | -2.22/-1.40 |
| θ(80°) | 0.86/1.26 | 0.15/-2.16 | -2.17/-3.57 | -3.35/-2.53 | -3.22/-6.03 | -5.01/-2.88 | -1.87/-2.49 | -8.20/-11.08 | -3.94/-0.87 | 0.75/-1.18 | -5.30/-7.24 | -6.19/-3.60 | -2.47/-1.16 | -1.91/-1.72 | -0.60/-0.48 | -1.34/-2.02 | -3.02/-2.85 | -3.32/-1.60 |
| θ(90°) | 0.82/1.48 | -0.64/-2.40 | -2.69/-3.74 | -3.49/-2.80 | -3.51/-5.51 | -3.84/-3.29 | -3.73/-4.73 | -9.87/-11.22 | -3.24/-2.88 | -3.45/-3.33 | -4.71/-4.43 | -5.02/-2.77 | -2.07/-0.63 | -2.14/-2.45 | -0.62/-0.26 | -0.56/-3.43 | -3.56/-3.55 | -3.33/-1.12 |
| θ(100°) | 1.25/0.89 | -1.09/-1.71 | -3.59/-5.04 | -4.35/-4.00 | -4.68/-3.24 | -1.76/-3.69 | -5.66/-7.46 | -12.07/-10.37 | -3.20/-3.66 | -12.34/-4.67 | -5.00/-4.03 | -4.55/-3.14 | -5.42/-2.90 | -1.73/-3.79 | -4.32/-2.27 | -2.70/-4.49 | -3.00/-2.48 | -3.60/-1.29 |
| θ(110°) | 1.07/-0.03 | -1.90/-1.41 | -2.79/-3.93 | -4.80/-2.97 | -3.88/-3.07 | -3.48/-6.21 | -6.61/-8.97 | -10.87/-9.37 | -3.36/-3.93 | -15.81/-5.08 | -8.40/-6.59 | -4.46/-2.97 | -6.73/-5.01 | -2.95/-4.64 | -5.08/-3.72 | -3.08/-7.86 | -5.37/-3.05 | -2.87/-0.02 |
| θ(120°) | -1.10/-2.32 | -2.38/-1.95 | -2.88/-6.35 | -5.05/-3.78 | -3.09/-3.43 | -4.60/-6.37 | -5.91/-8.07 | -9.70/-11.22 | -6.50/-4.97 | -7.12/-4.98 | -12.37/-11.53 | -5.45/-3.39 | -4.90/-3.91 | -1.94/-4.37 | -2.81/-4.03 | -4.98/-7.45 | -2.73/-1.16 | -1.24/0.59 |
| θ(130°) | -2.43/-1.28 | -1.68/-0.98 | -3.98/-4.37 | -3.14/-2.61 | -4.99/-8.80 | -7.75/-5.58 | -5.73/-6.69 | -9.89/-9.97 | -14.94/-8.45 | -6.65/-5.08 | -9.77/-10.38 | -3.13/-10.06 | -5.60/-2.75 | -3.99/-4.02 | -4.88/-7.47 | -7.96/-8.97 | -4.23/-1.50 | -1.14/0.36 |
| θ(140°) | -4.88/-4.52 | -2.65/-4.25 | -6.10/-6.33 | -2.87/-1.33 | -1.69/-4.06 | -7.04/-5.20 | -4.02/-6.24 | -8.40/-7.28 | -10.85/-9.59 | -4.71/-5.05 | -4.00/-4.62 | -3.05/-5.11 | -3.20/-2.76 | -3.73/-3.40 | -6.66/-4.59 | -4.39/-2.73 | -1.81/-3.43 | -5.02/-3.68 |
| θ(150°) | -4.43/-4.65 | -4.78/-5.35 | -4.56/-3.41 | -3.65/-4.26 | -5.04/-6.47 | -8.38/-8.44 | -6.55/-6.13 | -5.89/-7.18 | -7.86/-10.77 | -9.72/-7.98 | -11.82/-10.20 | -8.15/-8.26 | -9.39/-7.44 | -6.28/-9.40 | -10.37/-5.74 | -5.41/-5.36 | -3.42/-3.34 | -5.49/-4.72 |
| θ(160°) | -2.07/-2.72 | -3.46/-4.00 | -3.83/-2.90 | -2.65/-4.00 | -6.26/-9.52 | -10.14/-10.46 | -9.94/-9.41 | -9.08/-8.22 | -9.89/-13.39 | -16.03/-15.02 | -15.40/-13.29 | -10.21/-8.00 | -9.26/-10.77 | -11.42/-11.31 | -11.86/-8.05 | -5.39/-4.15 | -3.20/-2.52 | -1.87/-2.11 |
| θ(170°) | -6.04/-7.73 | -8.91/-9.89 | -8.71/-8.52 | -7.59/-7.48 | -7.84/-7.34 | -6.92/-7.53 | -8.00/-9.04 | -11.92/-14.31 | -13.09/-11.60 | -9.50/-8.69 | -8.02/-8.27 | -9.26/-10.55 | -11.81/-15.14 | -15.24/-15.07 | -14.10/-9.68 | -7.34/-6.28 | -5.89/-4.76 | -4.90/-5.08 |
| θ(180°) | -6.66/-6.13 | -6.52/-5.29 | -5.29/-6.84 | -7.81/-8.45 | -10.10/-11.78 | -13.54/-12.06 | -11.73/-11.30 | -10.63/-9.79 | -9.50/-9.57 | -10.43/-11.64 | -11.41/-11.38 | -10.71/-10.09 | -10.20/-10.43 | -10.72/-11.46 | -12.20/-11.66 | -10.57/-10.10 | -11.41/-10.84 | -8.01/-7.11 |

E1(XY plane) – $\Theta(90)\Phi(0-360)$
 E2(XZ plane) – $\Theta(0-180)\Phi(0)$ and $\Theta(0-180)\Phi(180)$
 E3(YZ plane) – $\Theta(0-180)\Phi(90)$ and $\Theta(0-180)\Phi(270)$





Total Gain Data

Table with columns for Freq(Hz), 5.6GPol, TotalAnt. 1, and various gain values for different antenna configurations (e.g., Phi(0°)Phi(10°), Phi(20°)Phi(30°), etc.).



Antenna Pattern

Appendix C.2

Table with 20 columns for elevation angles (0 to 180 degrees) and 20 columns for azimuth angles (0 to 350 degrees). Includes Gain and Freq(Hz) rows.

E1(XY plane) – $\Theta(90)\Phi(0-360)$
 E2(XZ plane) – $\Theta(0-180)\Phi(0)$ and $\Theta(0-180)\Phi(180)$
 E3(YZ plane) – $\Theta(0-180)\Phi(90)$ and $\Theta(0-180)\Phi(270)$

