Antenna Test Report

Report No.: TEOT2303000211E4

Applicant Name: Sony Corporation
Manufacturer Name: Sony Corporation

Product Name: GSM/WCDMA/LTE/FR1 Phone with BT, DTS/UNII A/B/G/N/AC/AX, GPS, WPT & NFC
FCC ID: PY7-84558E

Measurements performed at
SGS Taiwan Ltd.
Hwaya District, Taiwan

Issued Date: March 31, 2023

	Name	Date & Signature
Prepared by:	Nandi Chen Sr. Engineer	 March 31, 2023
Approved by:	Shawn Yen Supervisor	 March 31, 2023

Distribution

Measurement System Information

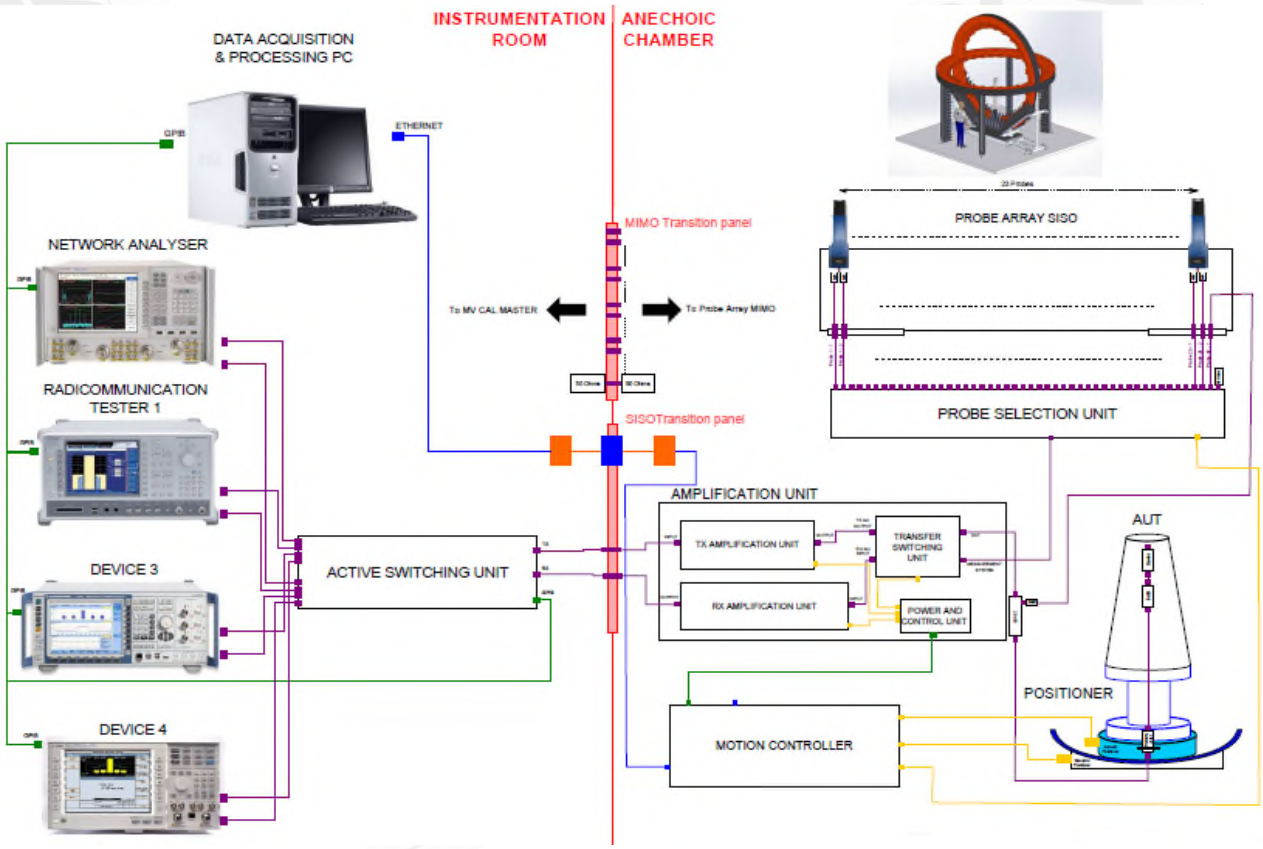
General Information

Testing Condition:

- Temperature: 22±3˚C
- Humidity: <80%

Measurement Facility:

- Measurement Chamber: MVG 3D fully anechoic chamber and its measuring system (Stargate-24-L)
- Network Analyzer: Agilent E5071C

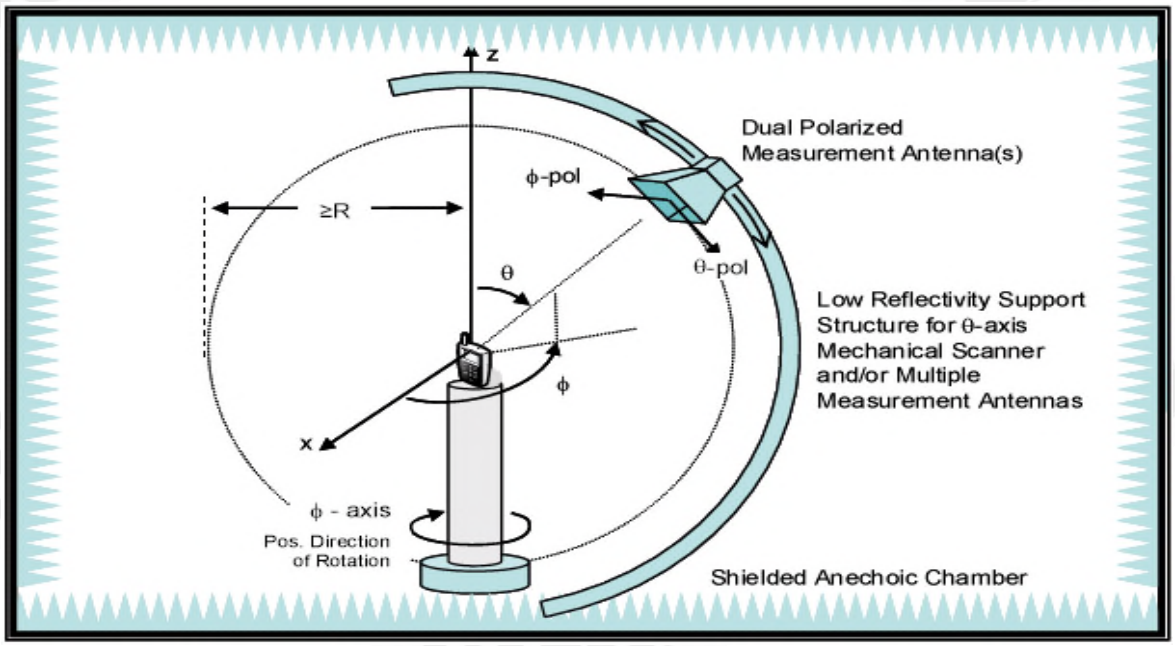


Measurements are performed in a MVG **Stargate-24-L** with the StarAct interface for a base station simulator. The **Stargate-24-L** has 23 probe antennas mounted with equal spacing on a circular arch. Electronic switching of the probe antennas provides outstanding measurement speed. The geometry of the setup, with only a Styrofoam column within 1.6 meters of the EUT, ensures minimum interference and low ripple on the measured radiation patterns. The EUT is placed on top of the pedestal, in the center of the system.

MVG **Stargate-24-L** uses analog RF signal generators to emit EM waves from the probe array to the EUT. It uses the NPAC as an RF receiver for antenna measurements.

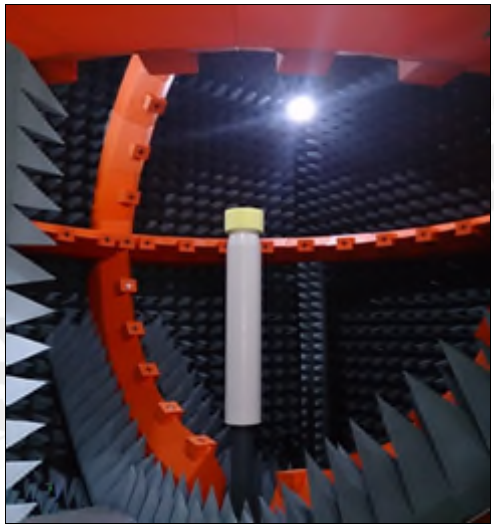
We test gain by illuminating the EUT with a frequency swept RF signal from anechoic chamber "source antennas". Then measure the EUT's gain (dBi) via the substitution method. The substitution method involves setting up the calibrated standard antenna over a radiated path accross the chamber, then normalizing (or "zeroing") that path loss to 0 dB. Then substitute EUT in place of standard antenna, and re-measure the change in path loss. By simply adding standard antenna's calibrated gain (dBi) to the change in path loss, it can determine EUT gain in dBi. In other words, the EUT's gain is measured relative to the standard antenna.

Typical Setup for MVG Stargate-24-L:



Instruments View

Inside View



Testing Laboratory: Identification of the Responsible Test Laboratory.

- **OTA Laboratory:**
  SGS Taiwan Ltd. Wireless Laboratory
  No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803.
  Telephone: +886 2 2299 3279
  Fax: +886 2 2298 0488
  Internet: http://www.tw.sgs.com

- **Testing Location:**
  No. 2, Keji 1st Rd., Hwaya Technology Park, Guishan District, Taoyuan City, Taiwan 33383.

Details of Applicant:

Applicant's name:	**Sony Corporation**
Applicant's address:	**1-7-1 Konan Minato-ku, Tokyo, 108-0075, Japan**

Details of Manufacturer:

Applicant's name:	**Sony Corporation**
Applicant's address:	**1-7-1 Konan Minato-ku, Tokyo, 108-0075, Japan**

Details of EUT:

Device Description:	**GSM/WCDMA/LTE/FR1 Phone with BT, DTS/UNII A/B/G/N/AC/AX, GPS, WPT & NFC**
Device Manufacturer:	**Sony Corporation**
Device Model:	**PY7-84558E**
Frequency Range:	**2402MHz ~ 7115MHz**
Antenna Type:	**Internal**
Antenna Size:	**WiFi Main: 27.00 (L) x 4.66 (W) x 8.3 (H) mm WiFi Sub: 16.58 (L) x 31.57 (W) x 2.32 (H) mm**

Duration of Tests:

Sample Receive Date:	**2022-12-30**
Test Starting Date:	**2022-12-30**
Test Ending Date:	**2023-02-18**
Report Issued Date:	**2023-03-31**

List of Equipment

Equipment Summary Sheet

Equipment Description	Manufacturer	Identification no.	S/N	Current calibration date	Next calibration date
Network Analyzer	Agilent	E5071C	MY46100433	2022/01/12	2023/01/11
				2023/01/16	2024/01/15
Sleeve Dipole	MVG	SD740	SD740-07	2022/01/07	2025/01/06
Dual Ridge Horn	MVG	SH800	S0051	2022/11/25	2023/11/24
Stargate-24-L probe array	MVG	Stargate-24-L	MVG	2022/08/26	2023/08/25
Measurement software	MVG	SPM V1.9	N/A	N/A	N/A

Test Results

WiFi Main Antenna

Antenna Gain and Efficiency

Freq(MHz)	Peak Gain (dBi)	Efficiency
2402	-1.86	18.91%
2441	-0.43	24.57%
2480	-0.77	23.48%
5180	-1.62	11.15%
5240	-0.45	13.32%
5260	-0.29	13.35%
5320	-0.45	14.99%
5500	-0.51	19.50%
5540	-0.26	22.04%
5600	0.37	22.09%
5660	0.53	23.98%
5700	0.35	24.15%
5720	0.38	23.86%
5725	0.27	23.13%
5745	0.38	23.96%
5800	0.00	24.19%
5825	-0.22	23.73%
5850	-0.27	24.29%
5925	-0.36	22.23%

Freq(MHz)	Peak Gain (dBi)	Efficiency
5945	-1.01	21.27%
5955	-1.43	21.97%
6050	-1.68	19.45%
6175	-2.12	15.83%
6300	-1.40	15.56%
6415	-1.30	15.05%
6425	-1.47	15.03%
6435	-1.60	14.87%
6475	-1.68	14.56%
6515	-1.94	14.85%
6525	-2.34	14.21%
6535	-2.33	14.22%
6640	-2.32	15.91%
6760	-2.86	17.04%
6875	-2.61	15.27%
6895	-2.54	15.86%
7000	-3.10	14.14%
7115	-2.82	13.09%
7125	-2.62	13.47%

Maximum Gain

- **2402 MHz – 2480 MHz: -0.43 dBi**
- **5180 MHz – 5320 MHz: -0.29 dBi**
- **5500 MHz – 5720 MHz: 0.53 dBi**
- **5725 MHz – 5850 MHz: 0.38 dBi**
- **5955 MHz – 6415 MHz: -1.30 dBi**
- **6435 MHz – 6515 MHz: -1.60 dBi**
- **6535 MHz – 6875 MHz: -2.32 dBi**
- **6895 MHz – 7115 MHz: -2.54 dBi**

WiFi Sub Antenna
Gain and Efficiency

Freq(MHz)	Peak Gain (dBi)	Efficiency
2402	-4.55	10.26%
2441	-4.44	10.45%
2480	-5.15	9.11%
5180	-1.82	12.29%
5240	-0.57	16.58%
5260	-0.36	17.70%
5320	0.61	17.73%
5500	-0.43	11.61%
5540	-0.91	11.19%
5600	-2.42	10.00%
5660	-3.15	8.80%
5700	-3.40	8.11%
5720	-3.56	7.67%
5725	-3.78	7.19%
5745	-3.72	7.23%
5800	-3.92	7.14%
5825	-4.33	6.51%
5850	-3.93	6.86%
5925	-3.88	6.03%

Freq(MHz)	Peak Gain (dBi)	Efficiency
5945	-4.02	5.75%
5955	-3.98	5.87%
6050	-4.79	5.14%
6175	-4.32	4.83%
6300	-4.27	5.73%
6415	-4.02	6.36%
6425	-4.00	6.31%
6435	-3.83	6.40%
6475	-3.42	6.41%
6515	-2.87	6.69%
6525	-2.90	6.54%
6535	-2.55	6.97%
6640	-2.33	7.67%
6760	-4.32	5.67%
6875	-4.22	5.01%
6895	-4.19	4.36%
7000	-4.33	4.65%
7115	-3.82	4.45%
7125	-3.56	4.66%

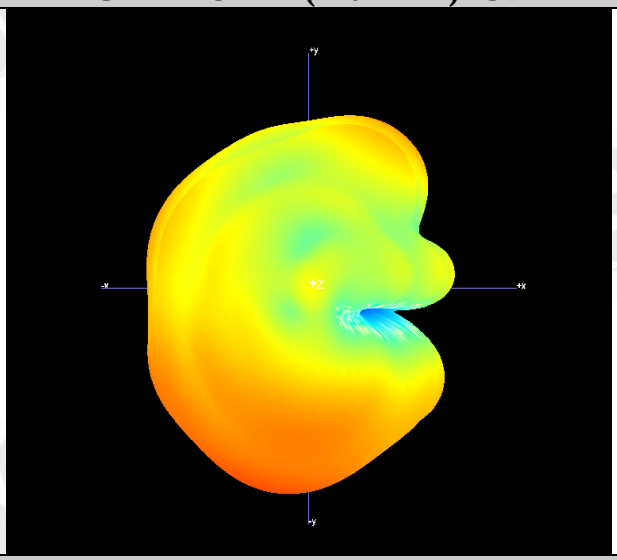
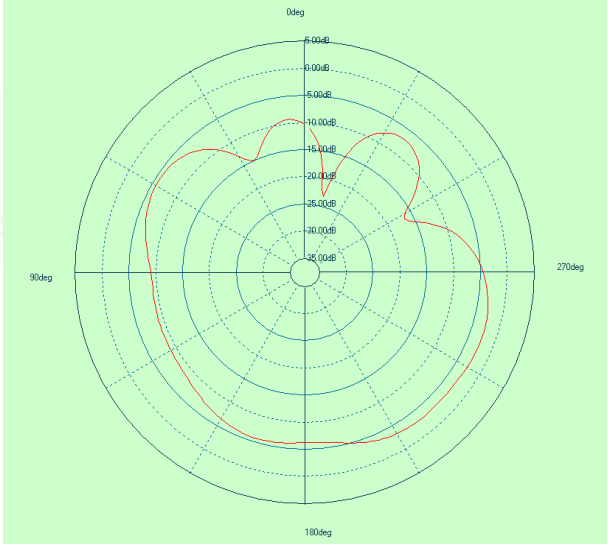
Maximum Gain

- **2402 MHz – 2480 MHz: -4.44 dBi**
- **5180 MHz – 5320 MHz: 0.61 dBi**
- **5500 MHz – 5720 MHz: -0.43 dBi**
- **5725 MHz – 5850 MHz: -3.72 dBi**
- **5955 MHz – 6415 MHz: -3.98 dBi**
- **6435 MHz – 6515 MHz: -2.87 dBi**
- **6535 MHz – 6875 MHz: -2.33 dBi**
- **6895 MHz – 7115 MHz: -3.82 dBi**

Antenna 3D Plot Matrix

All plots in this section show the Gain Total (Gainθ + Gainφ) with the +x-axis pointing right, +y-axis pointing up, and +z-axis pointing out of the page.

WiFi Main Antenna

Free Space GAIN TOTAL (2402MHz) - 3D	Free Space GAIN TOTAL (2402MHz) – XY cut
	
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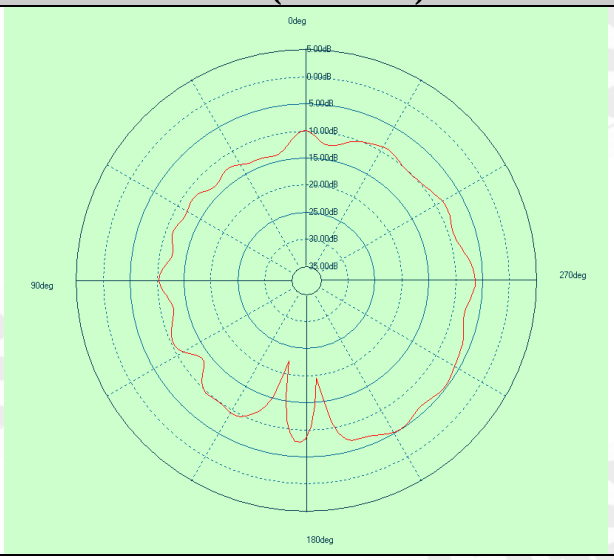	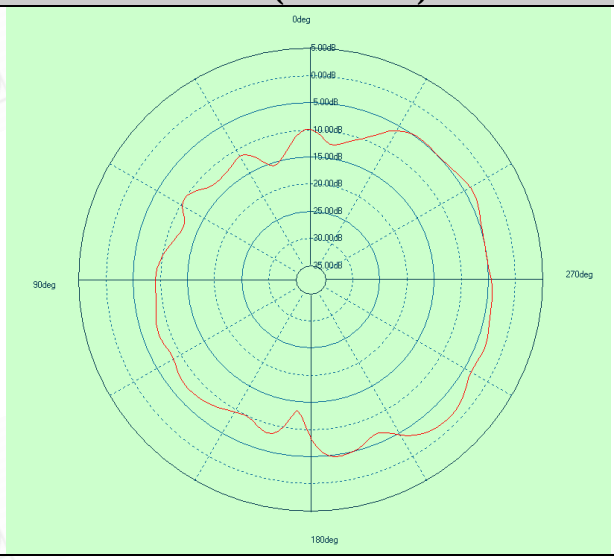

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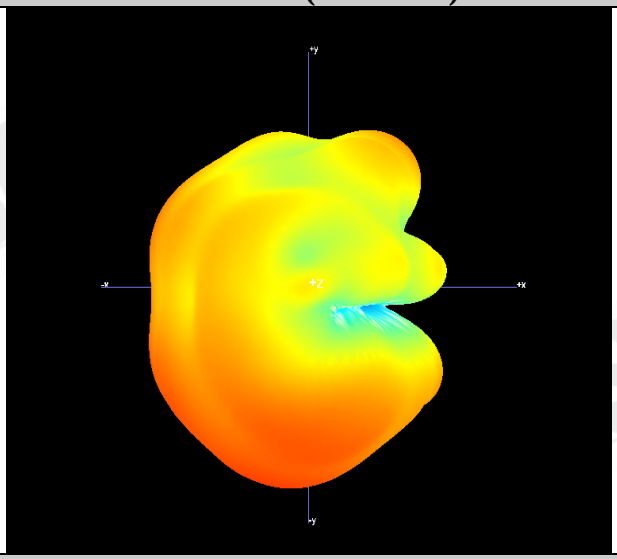	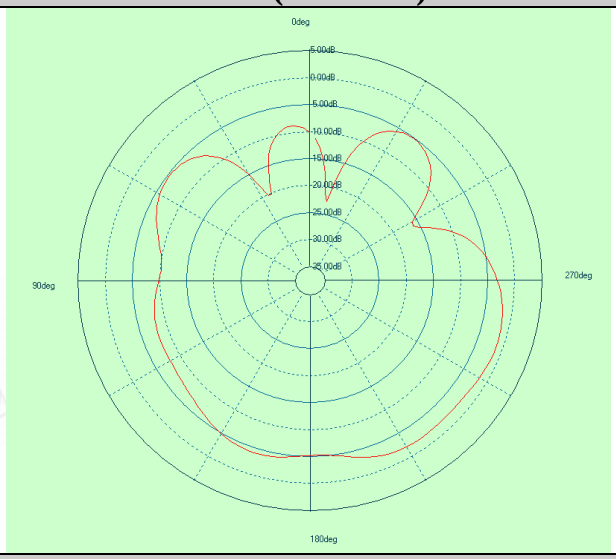
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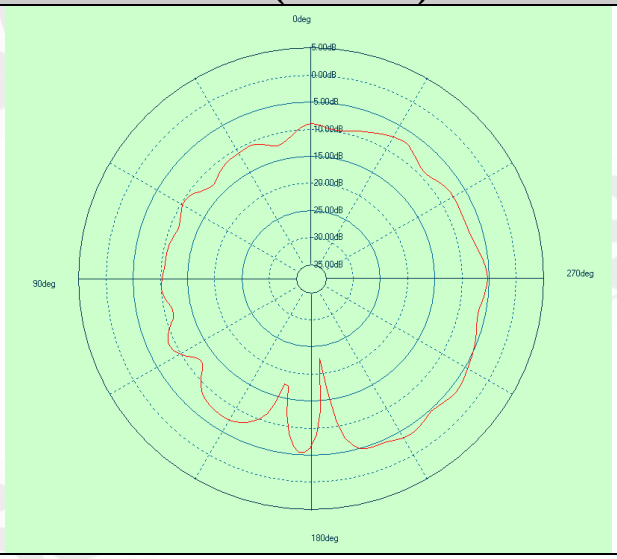	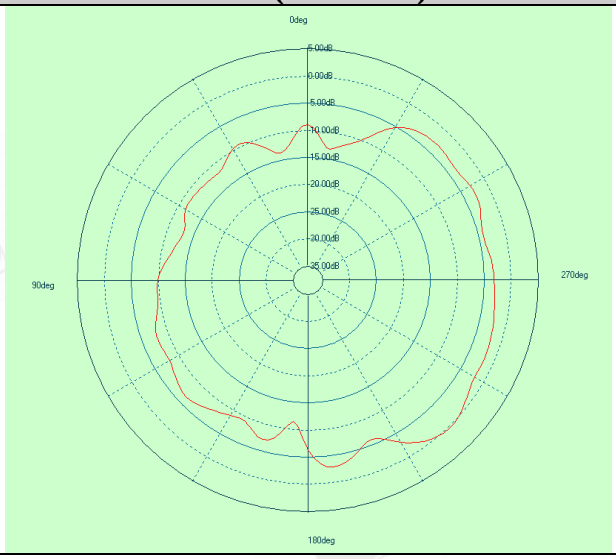

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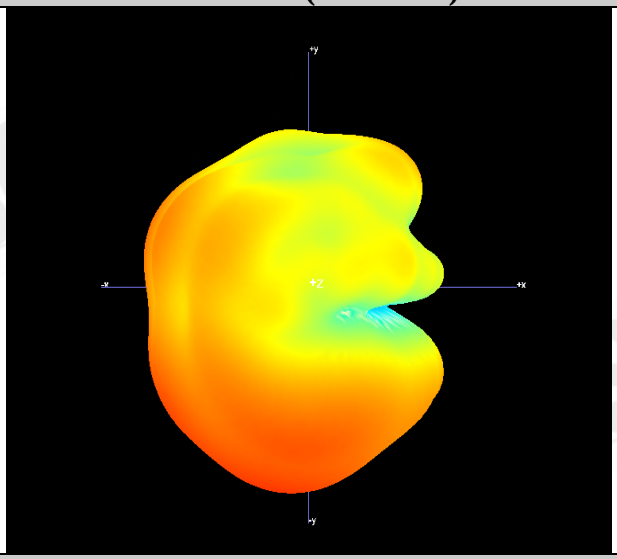
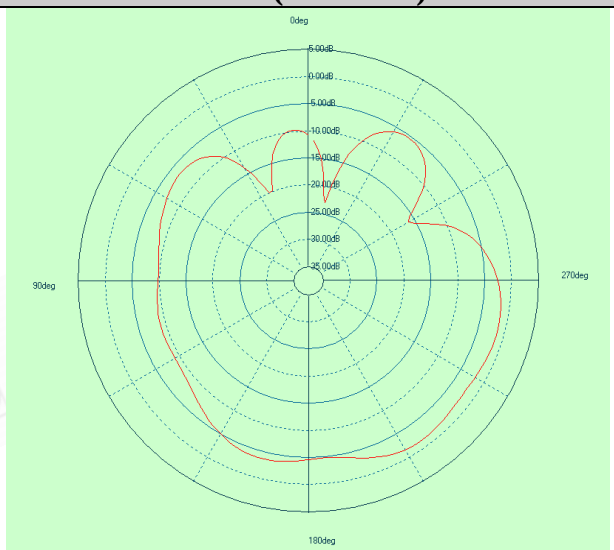
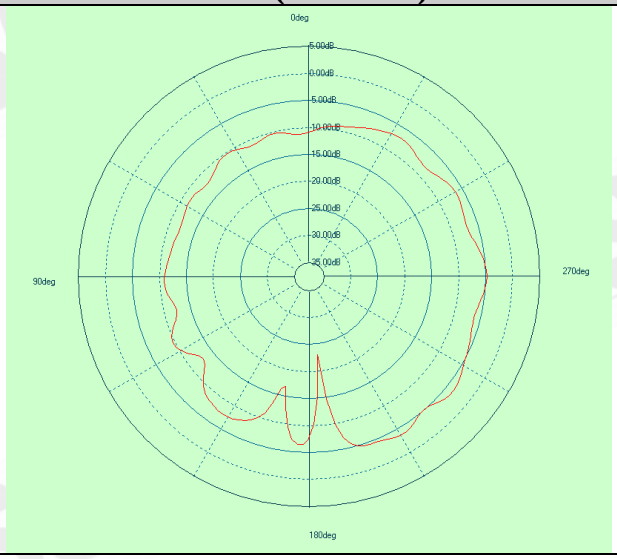
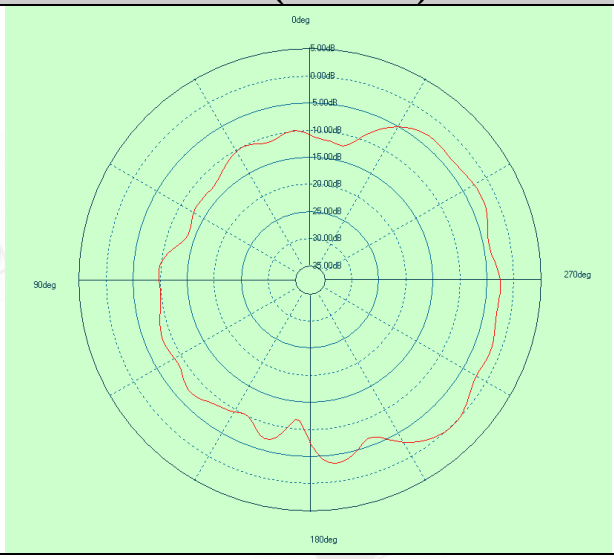
	
Free Space GAIN TOTAL (2480MHz) – XZ cut	**Free Space GAIN TOTAL (2480MHz) – YZ cut**
	

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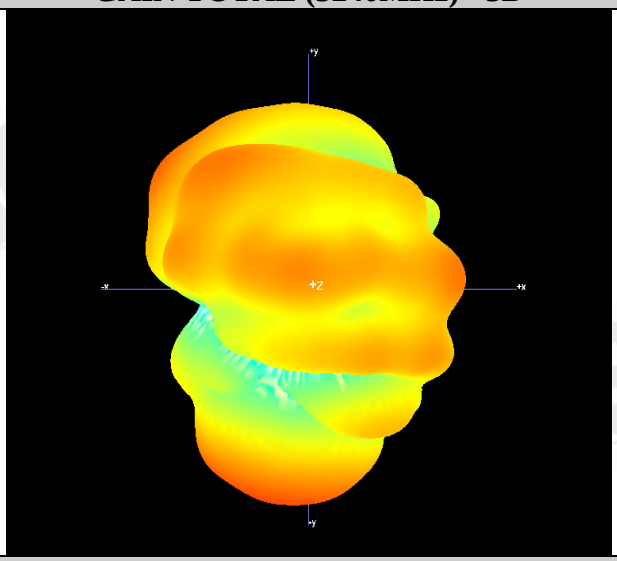	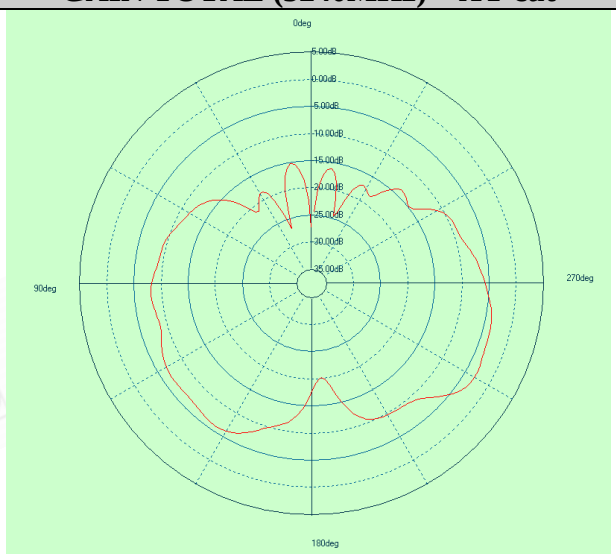
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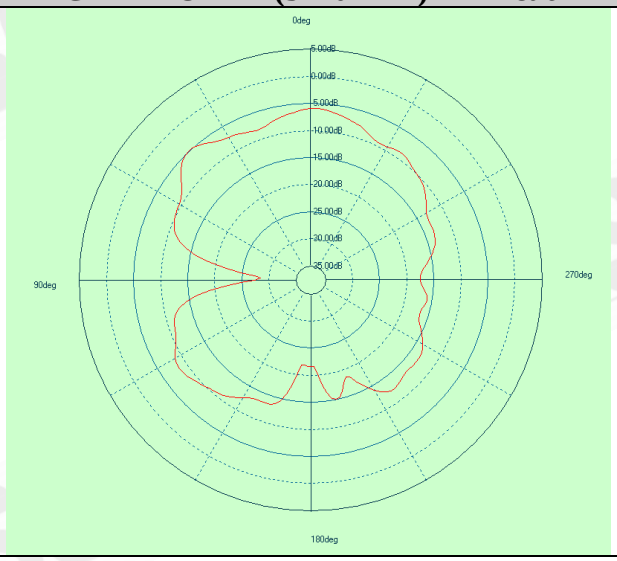	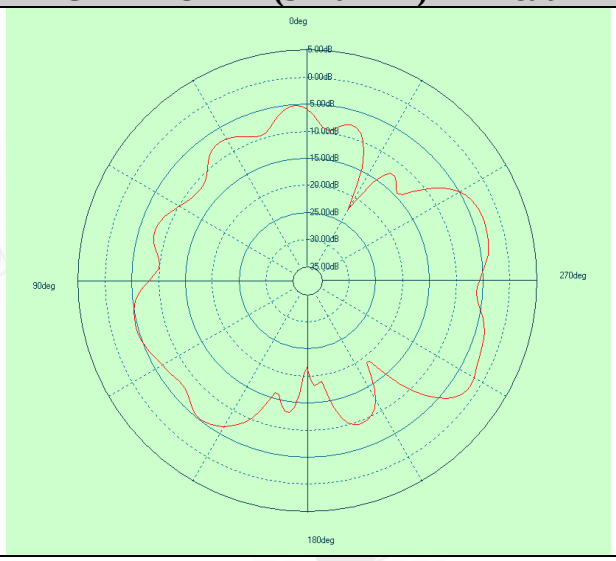

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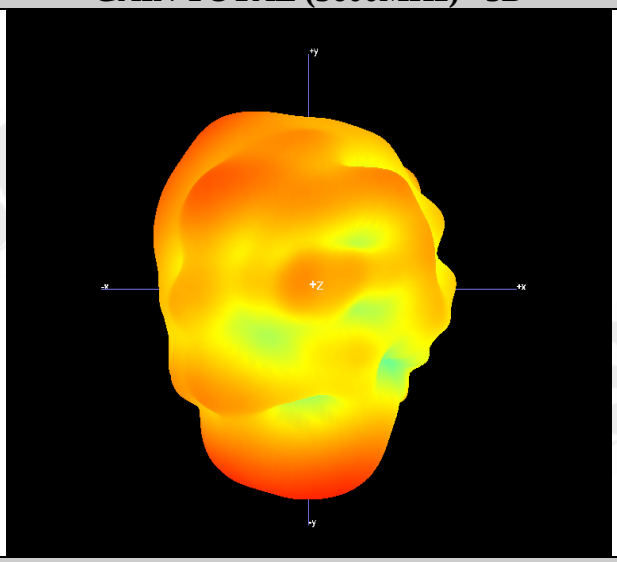	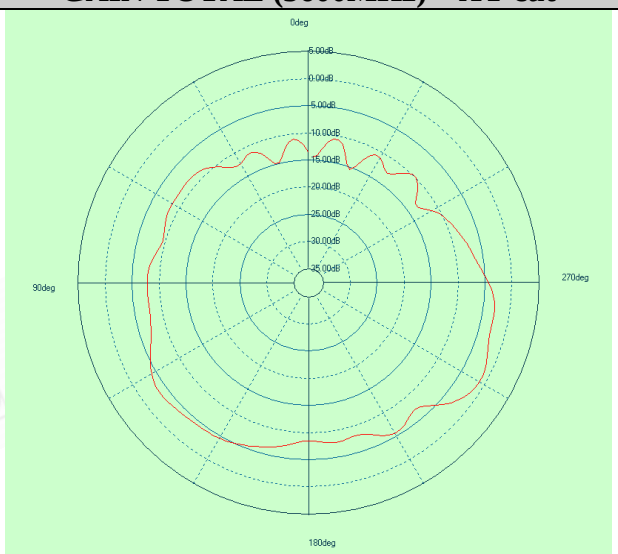
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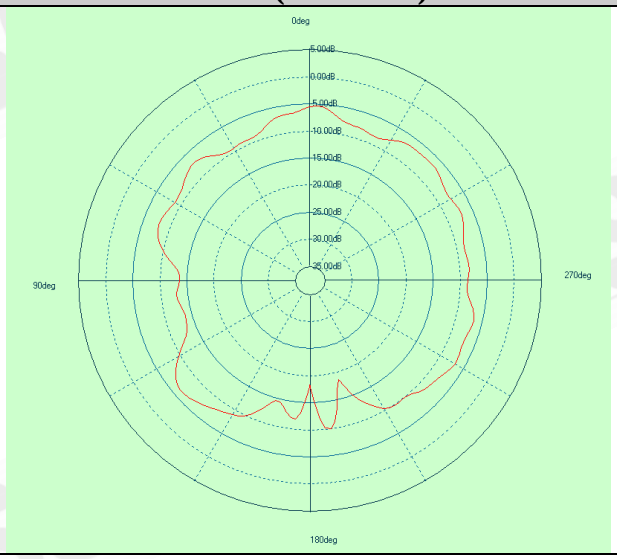	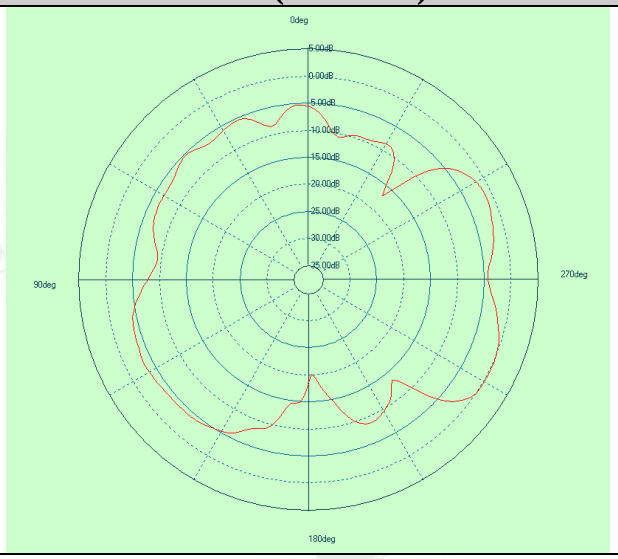

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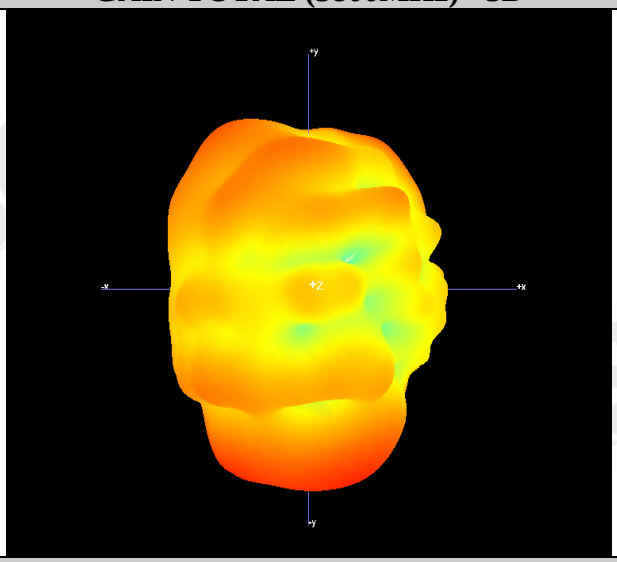	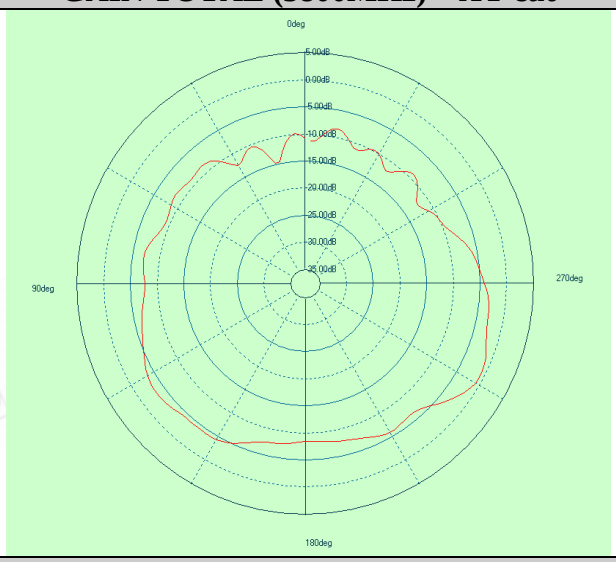
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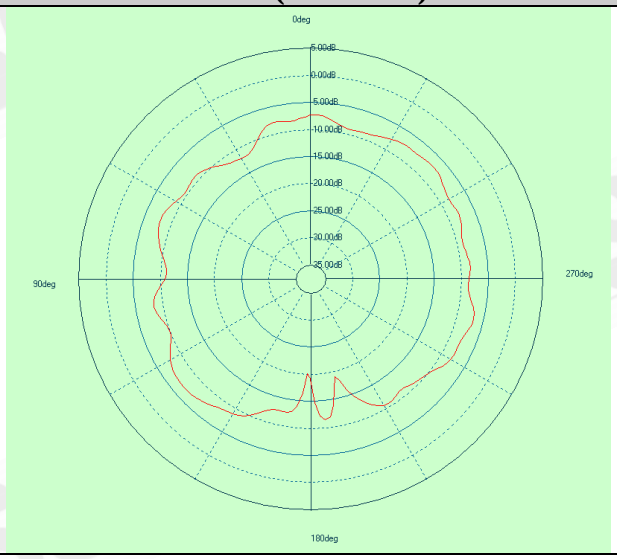	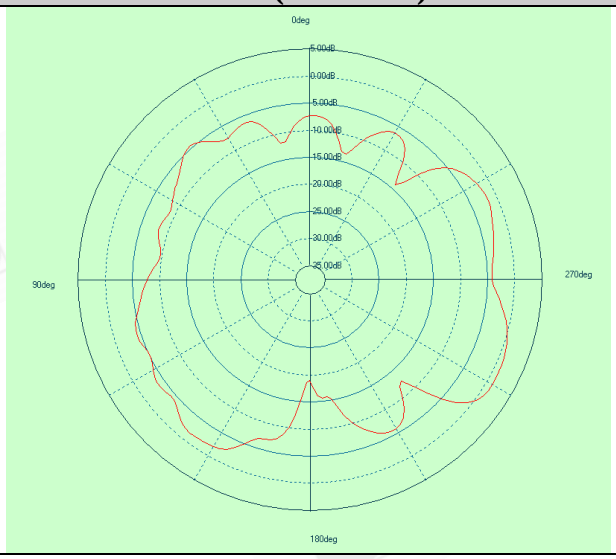

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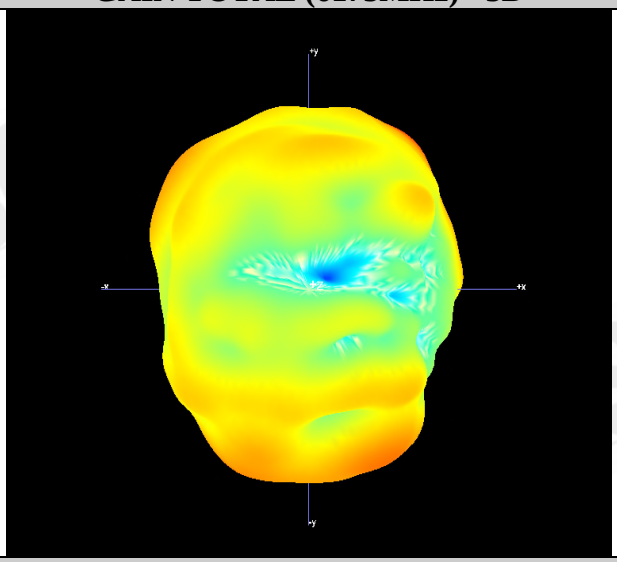	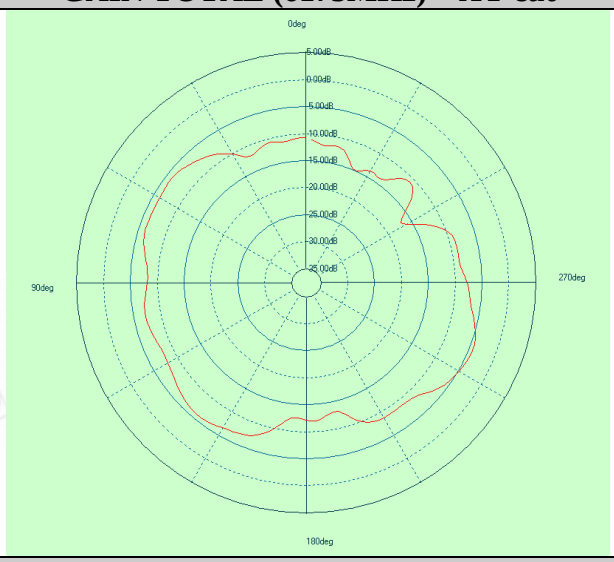
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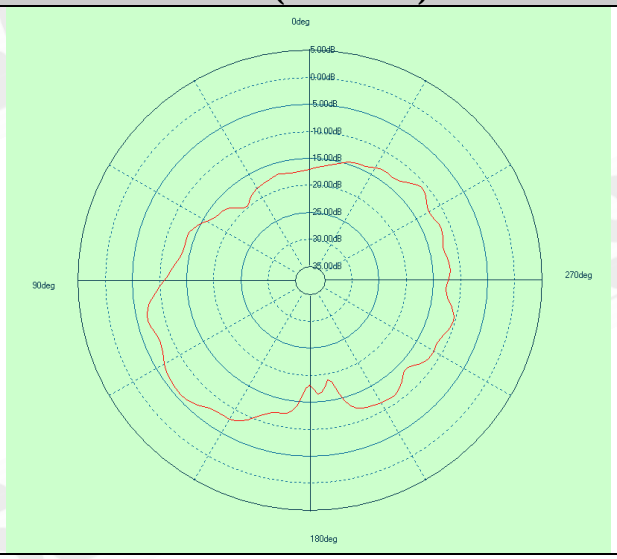	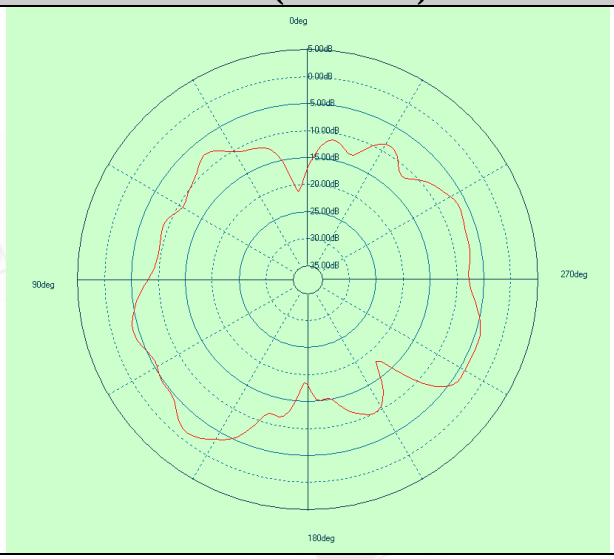

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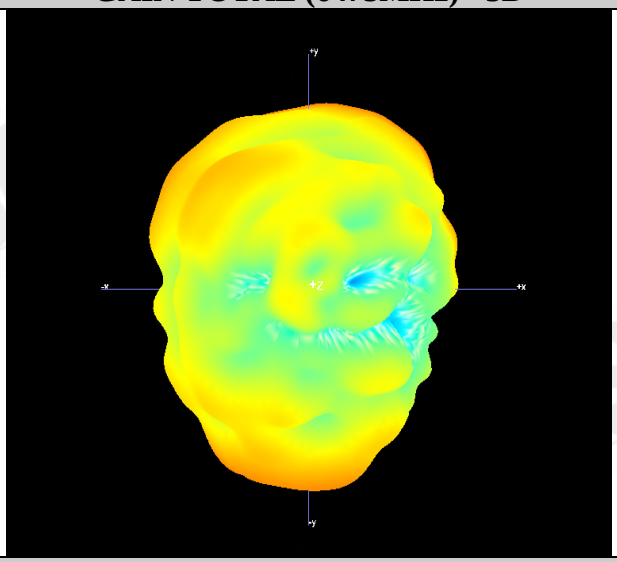
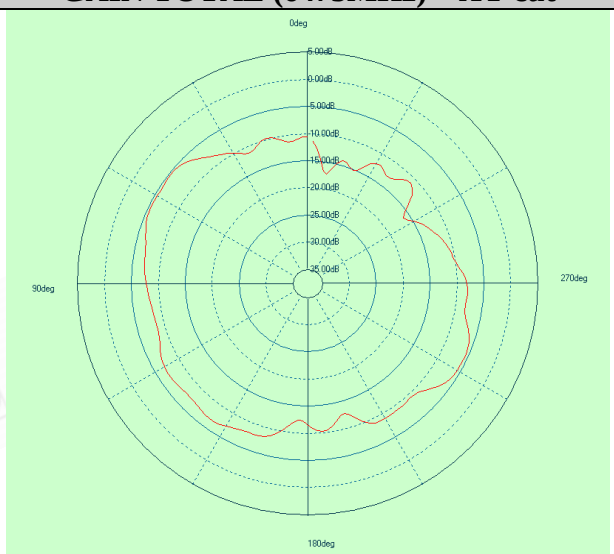
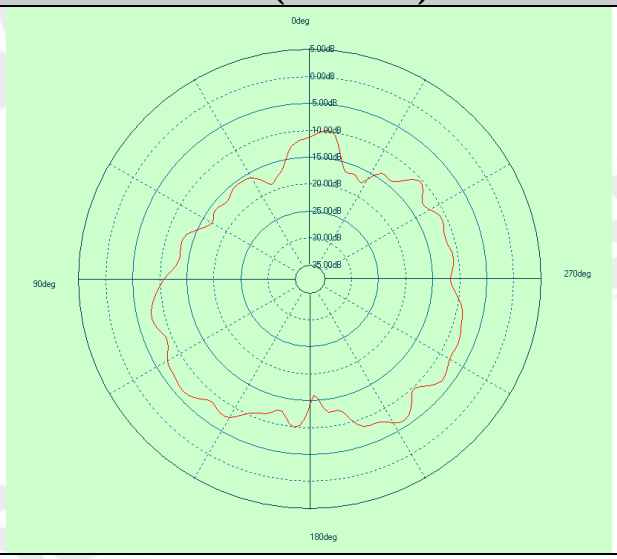
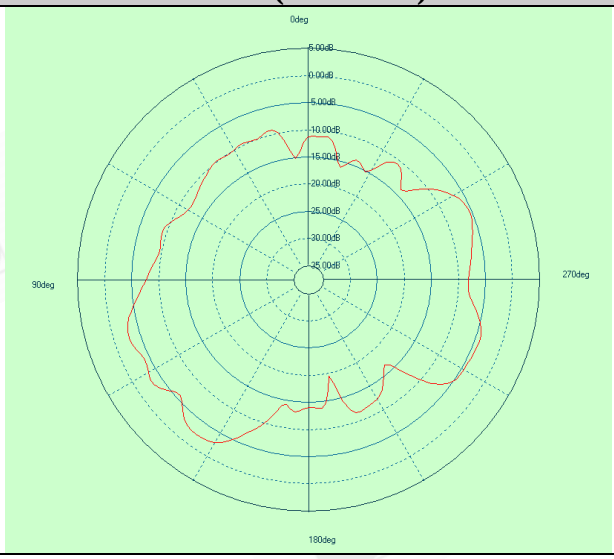
	
Free Space GAIN TOTAL (6475MHz) – XZ cut	**Free Space GAIN TOTAL (6475MHz) – YZ cut**
	

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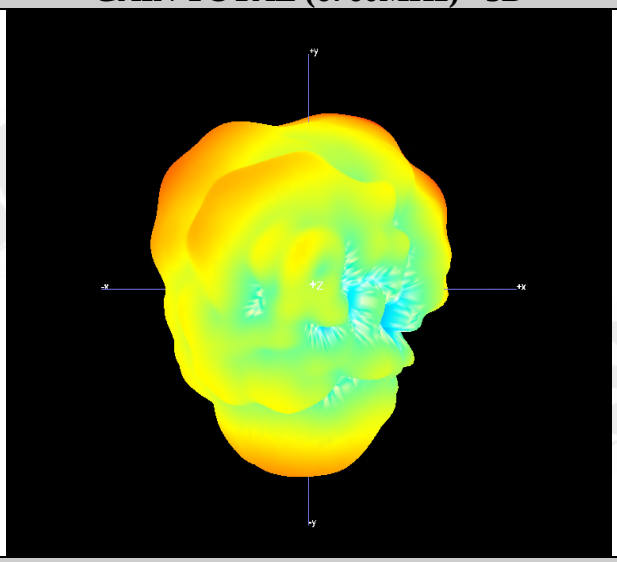
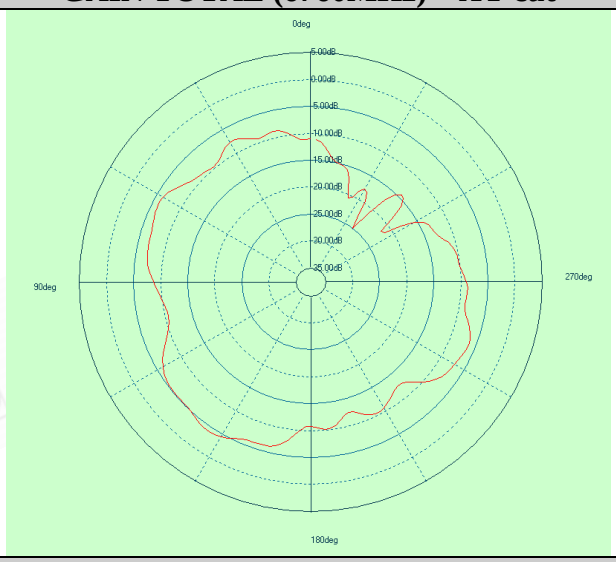
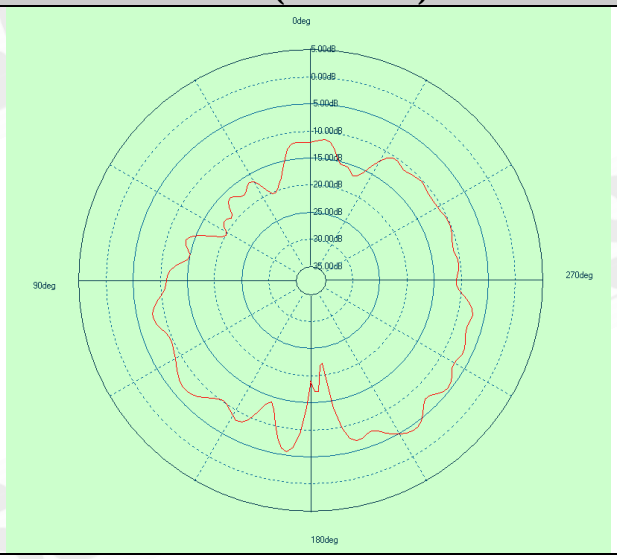
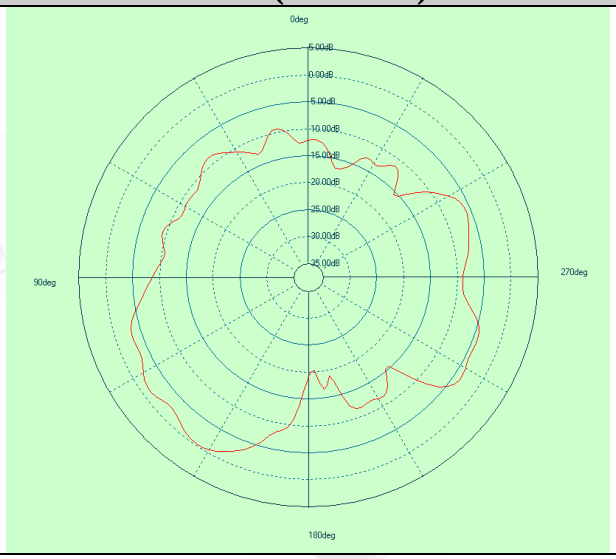
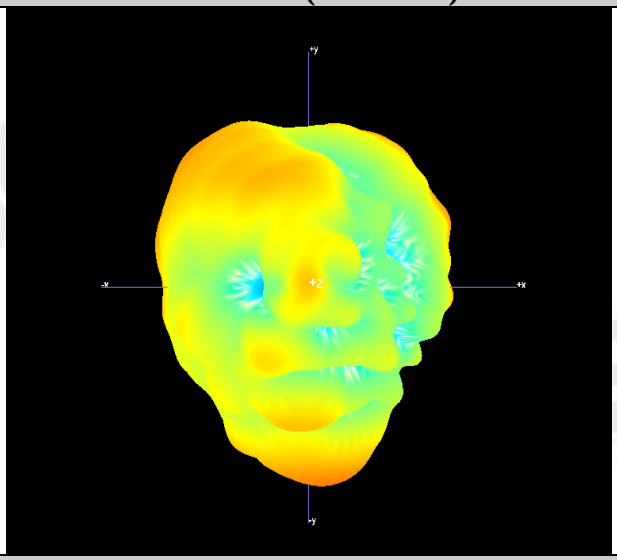
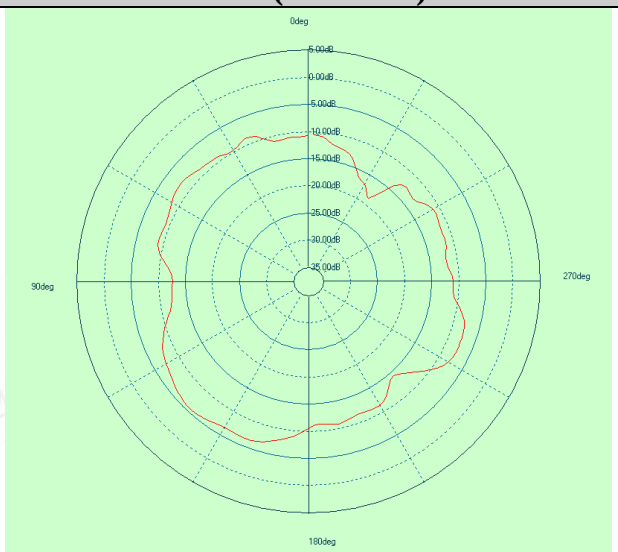
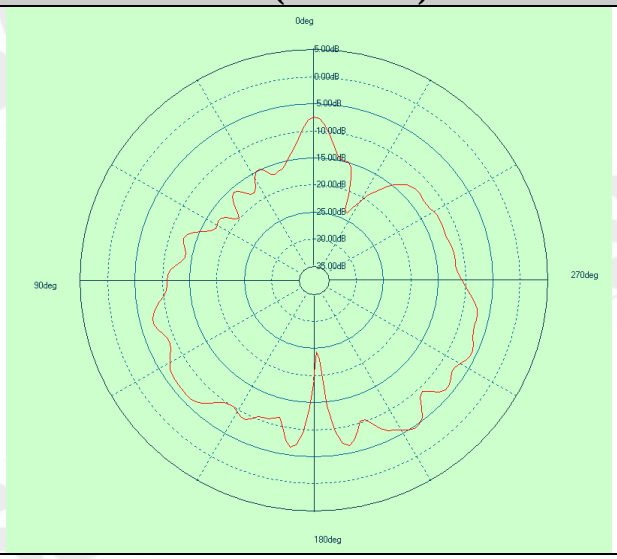
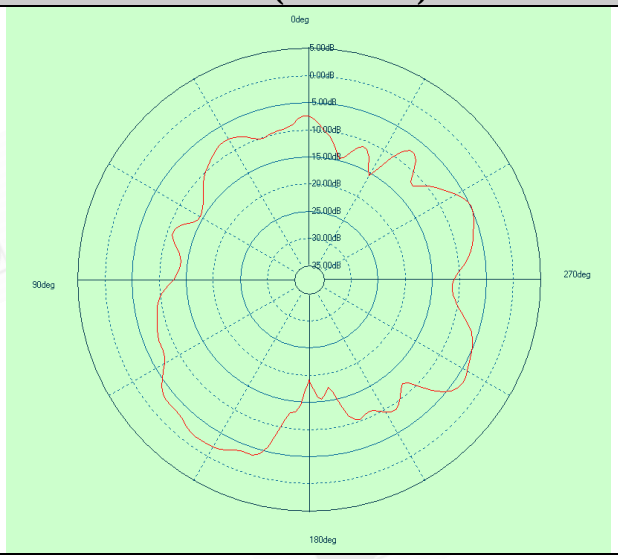
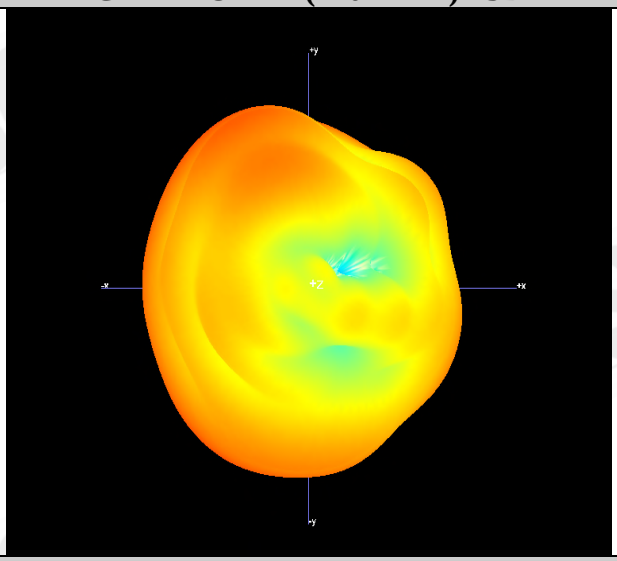
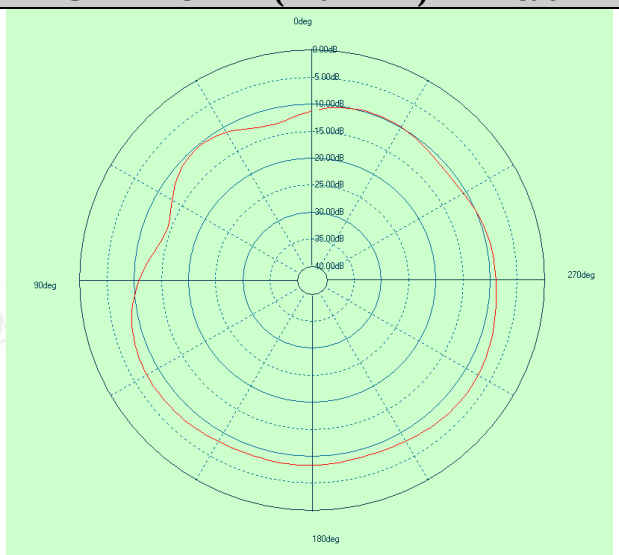
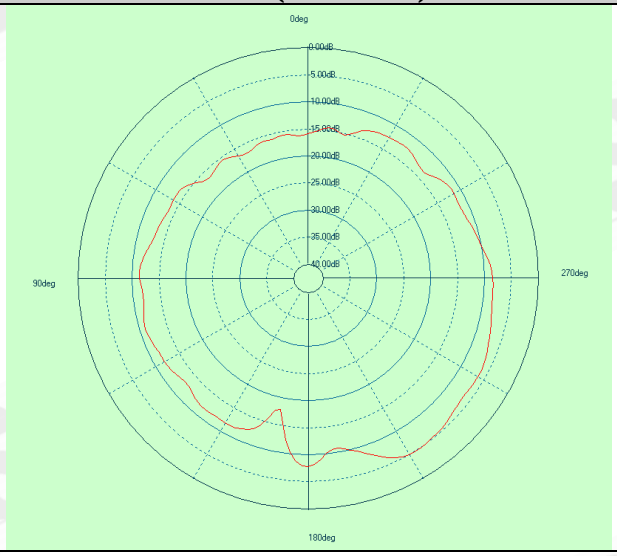
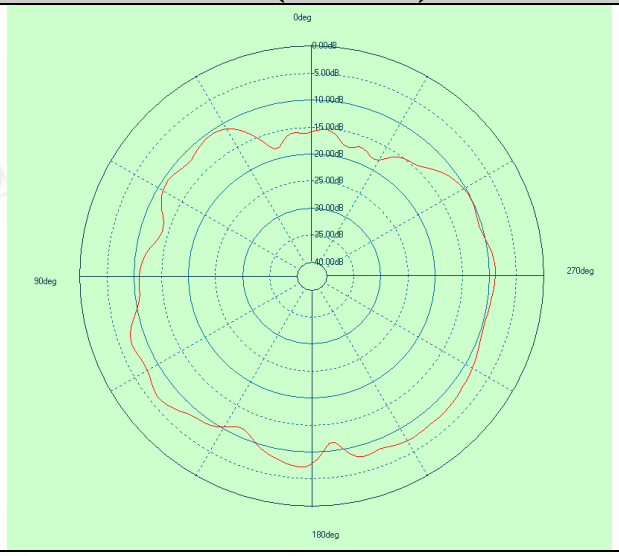
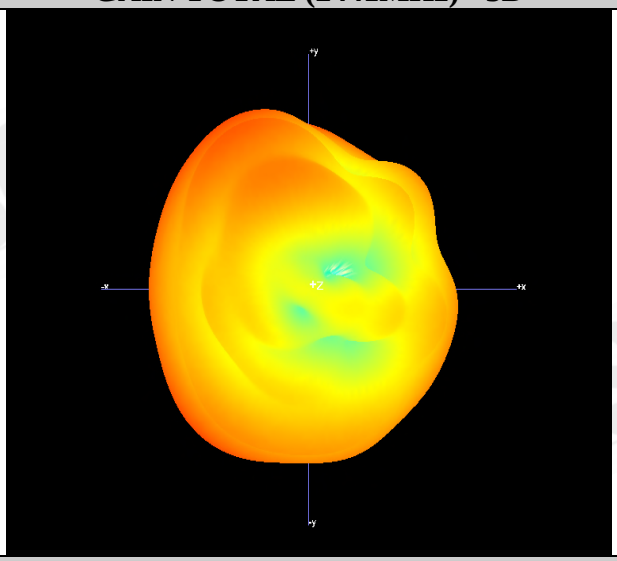
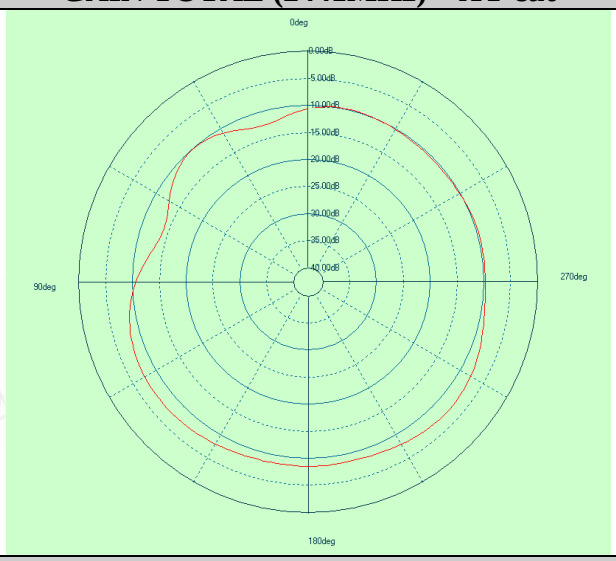
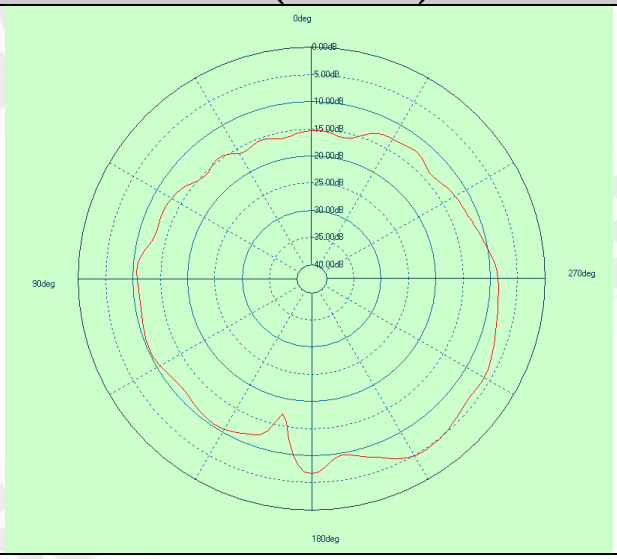
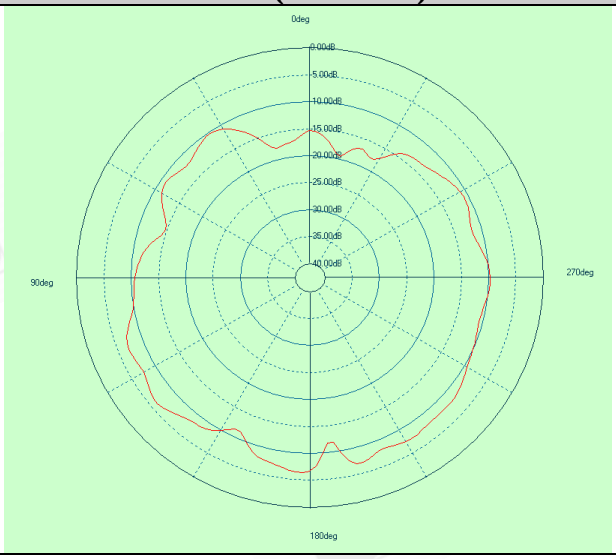
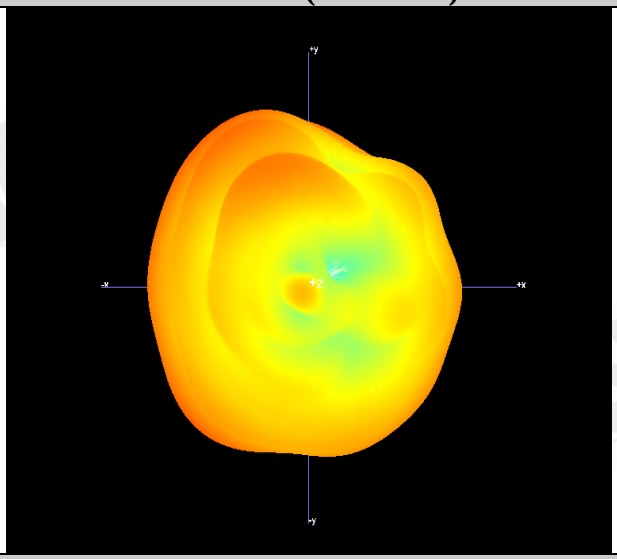
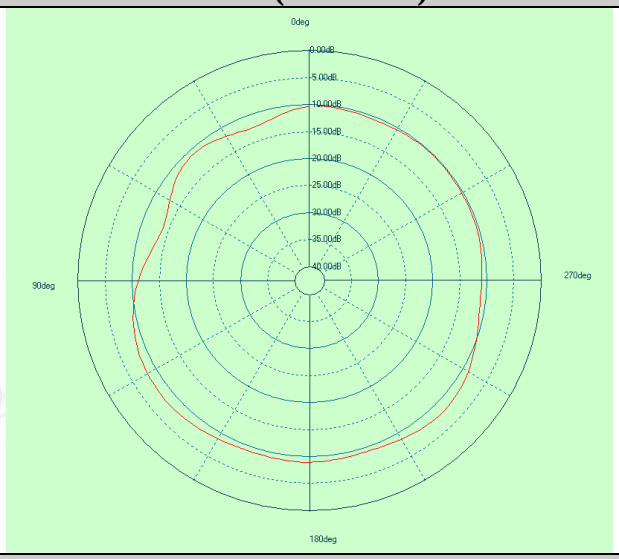
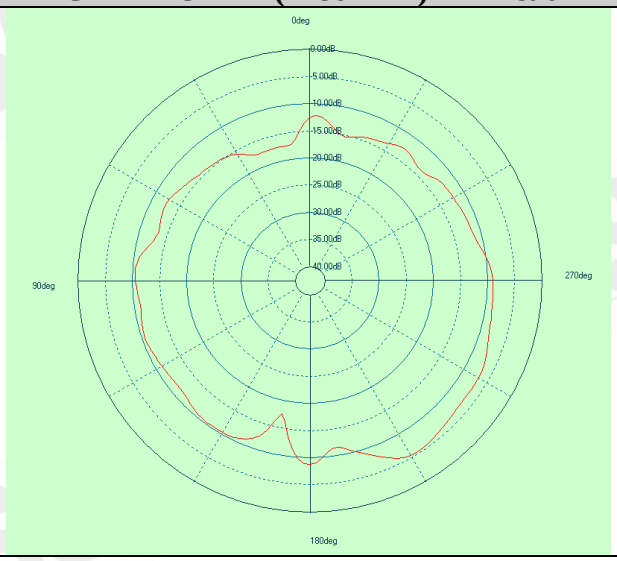
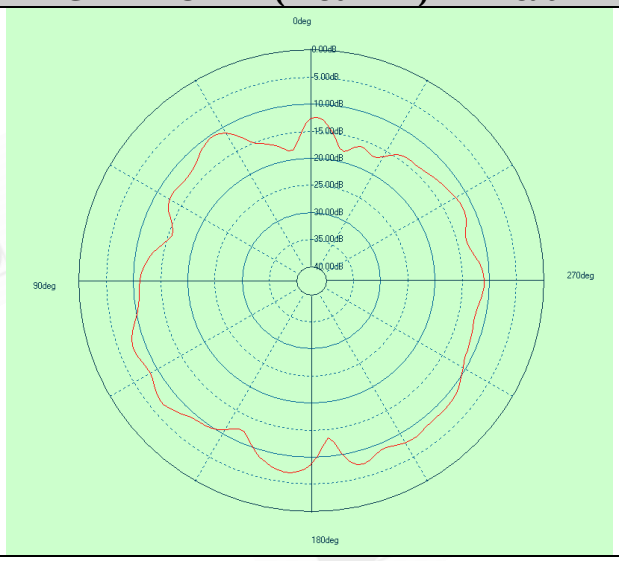
	
Free Space GAIN TOTAL (6760MHz) – XZ cut	**Free Space GAIN TOTAL (6760MHz) – YZ cut**
	

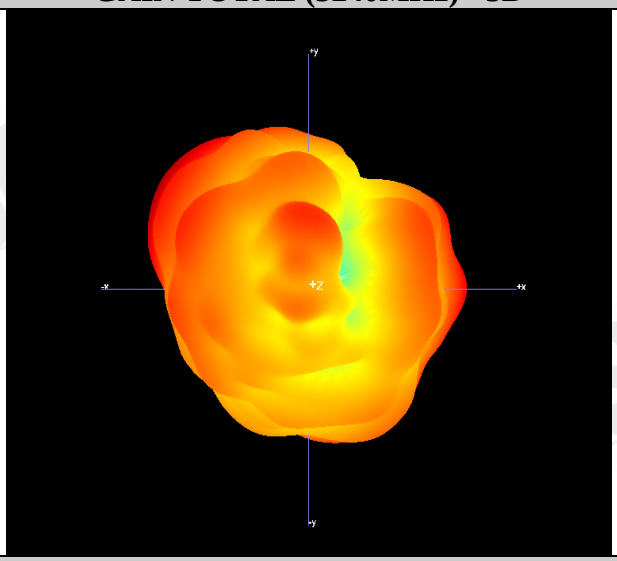
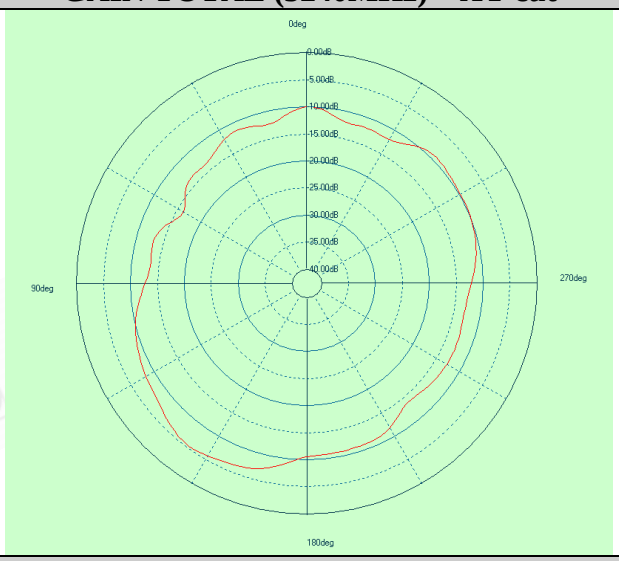
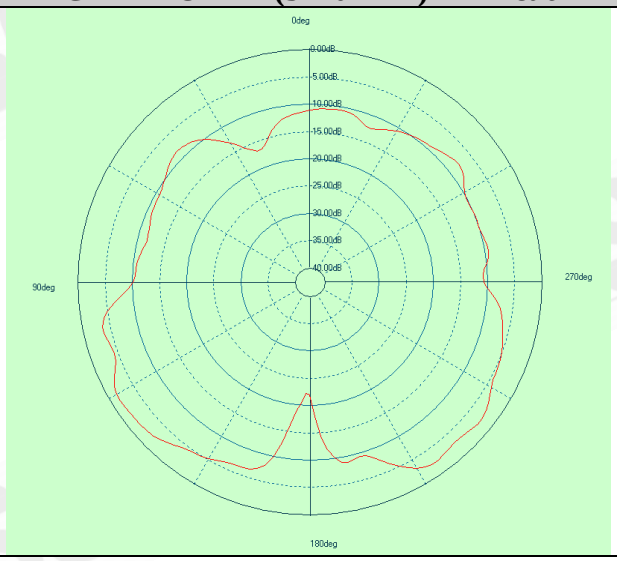
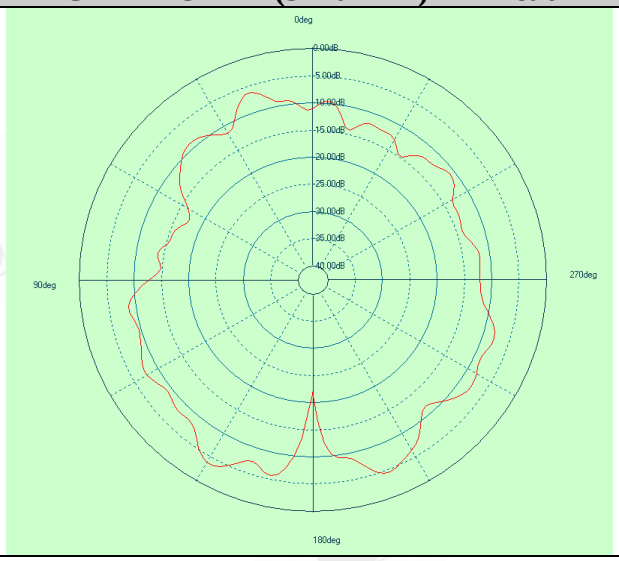
Free Space GAIN TOTAL (7000MHz) - 3D	Free Space GAIN TOTAL (7000MHz) – XY cut
	
Free Space GAIN TOTAL (7000MHz) – XZ cut	**Free Space GAIN TOTAL (7000MHz) – YZ cut**
	

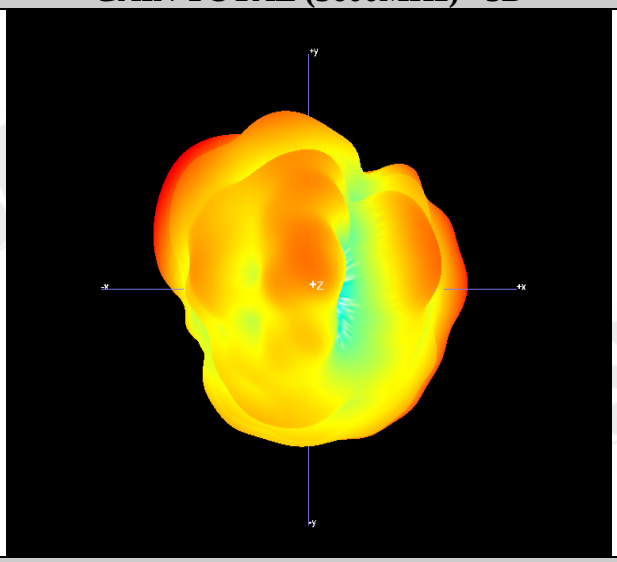
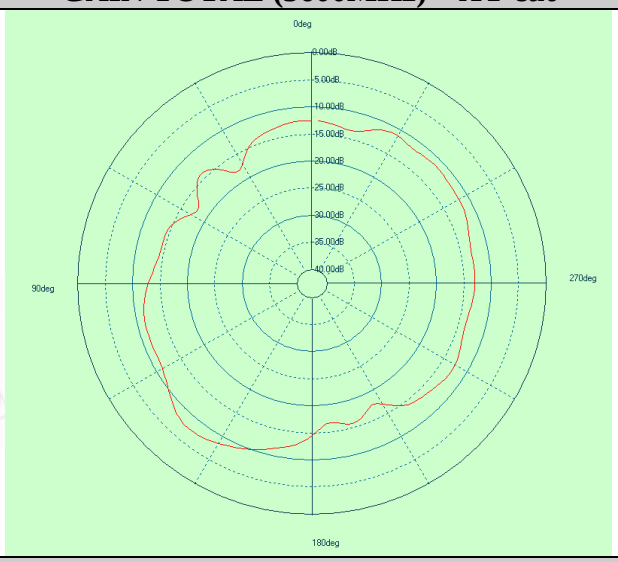
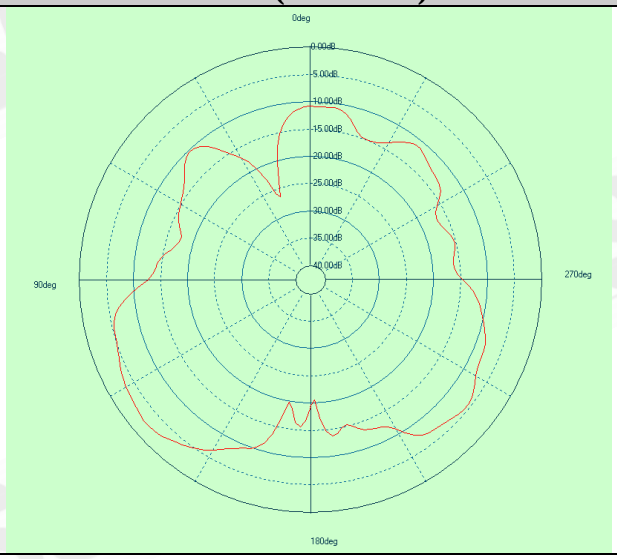
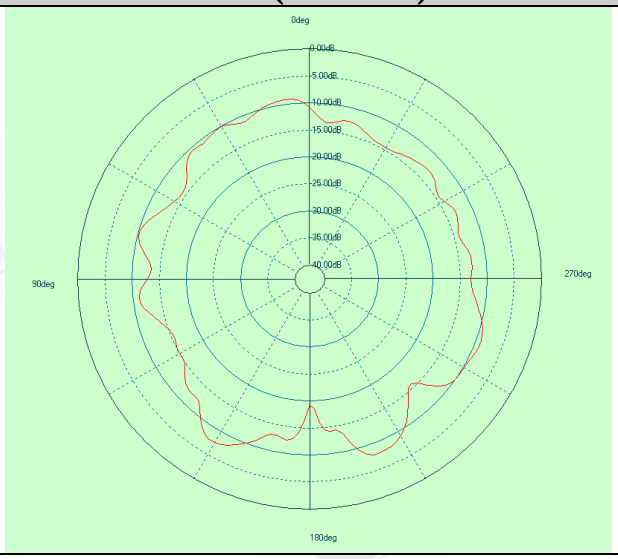
WiFi Sub Antenna

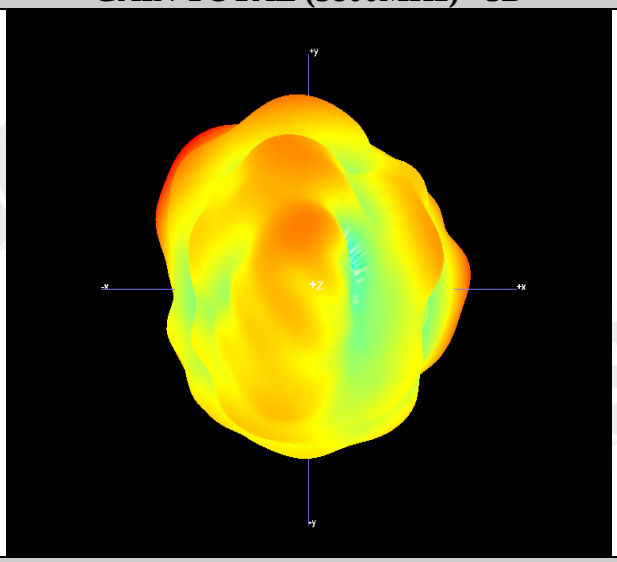
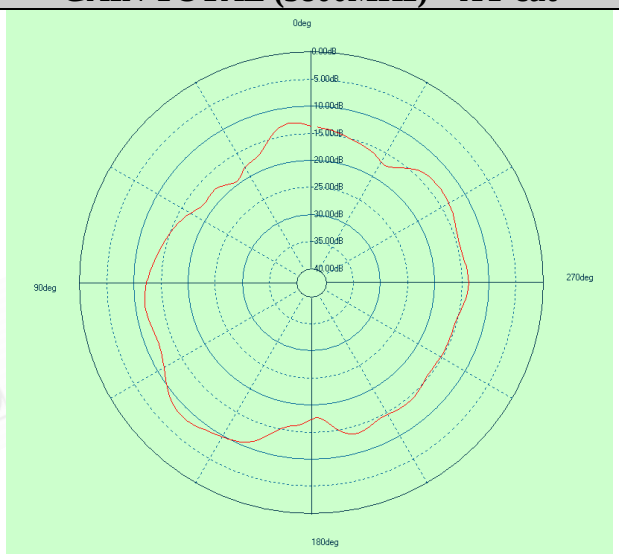
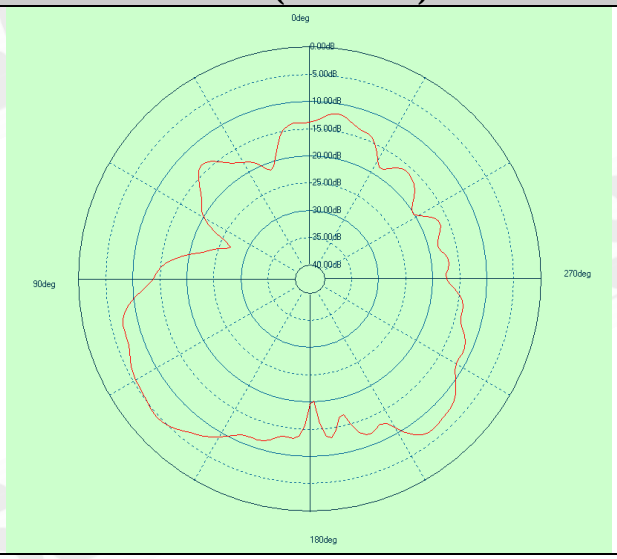
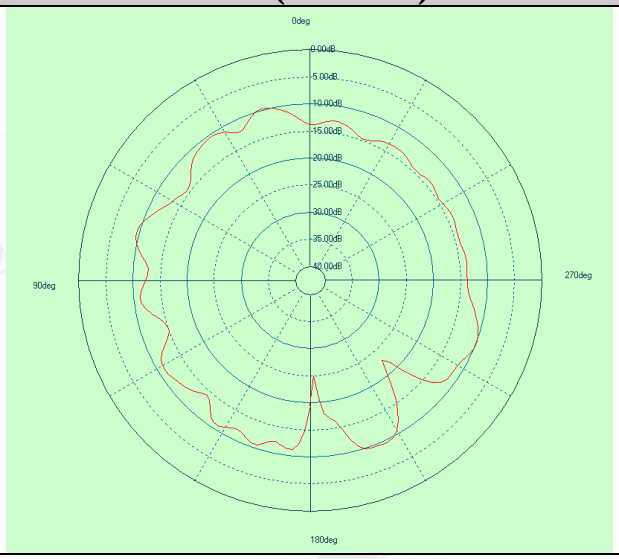
Free Space GAIN TOTAL (2402MHz) - 3D	Free Space GAIN TOTAL (2402MHz) – XY cut
	
Free Space GAIN TOTAL (2402MHz) – XZ cut	**Free Space GAIN TOTAL (2402MHz) – YZ cut**
	

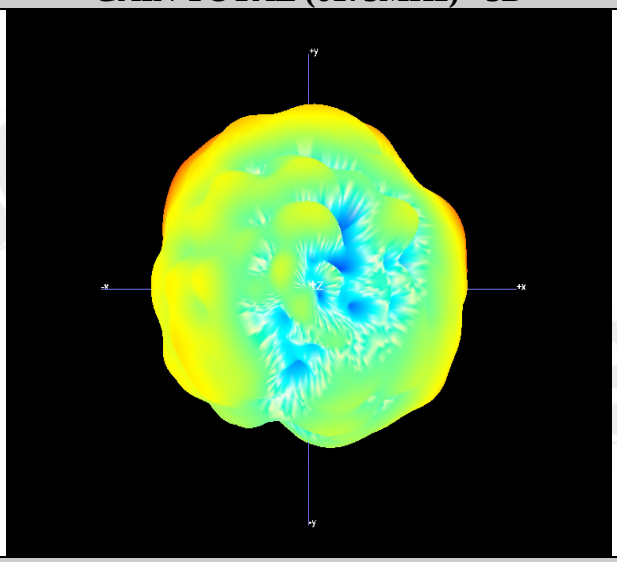
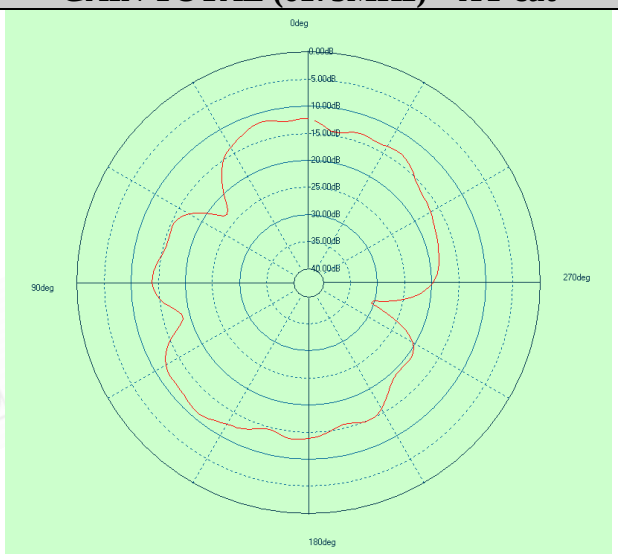
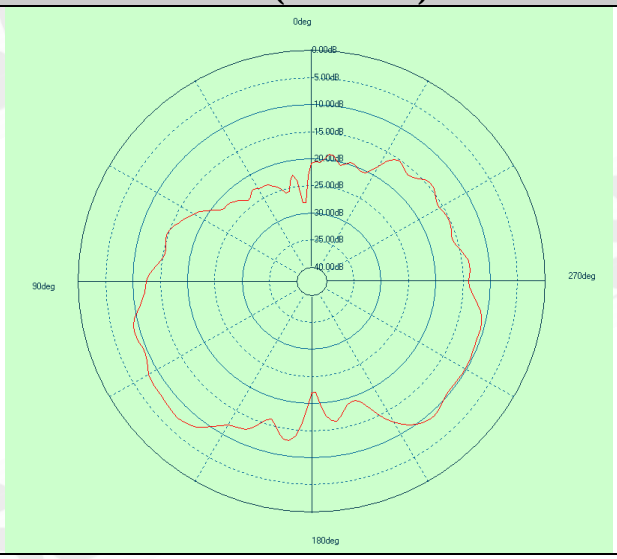
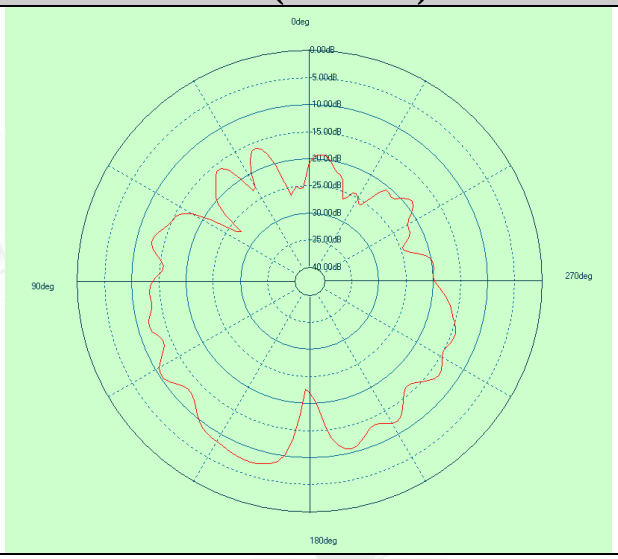
Free Space GAIN TOTAL (2441MHz) - 3D	Free Space GAIN TOTAL (2441MHz) – XY cut
	
Free Space GAIN TOTAL (2441MHz) – XZ cut	**Free Space GAIN TOTAL (2441MHz) – YZ cut**
	

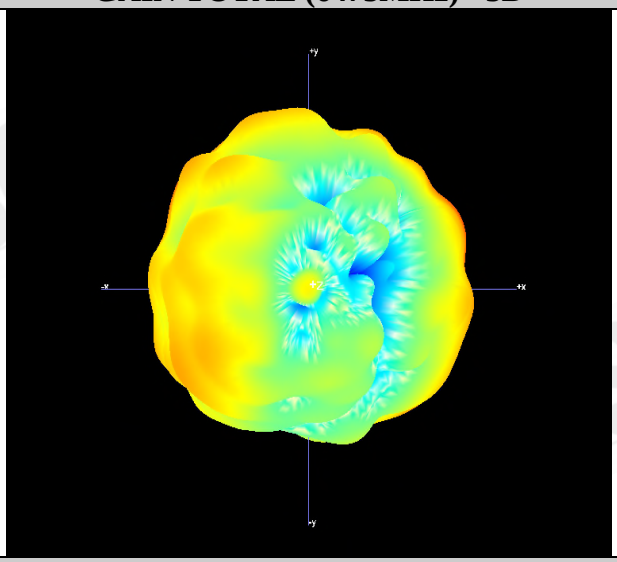
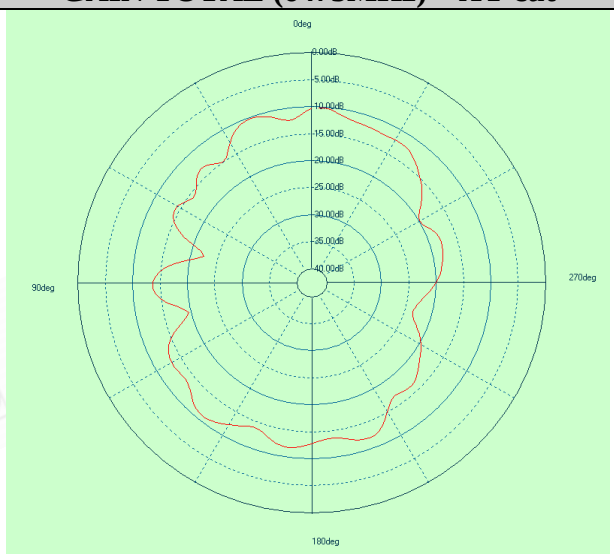
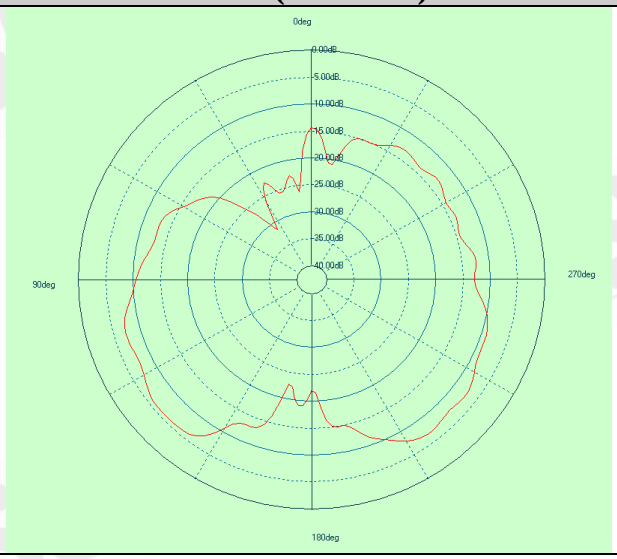
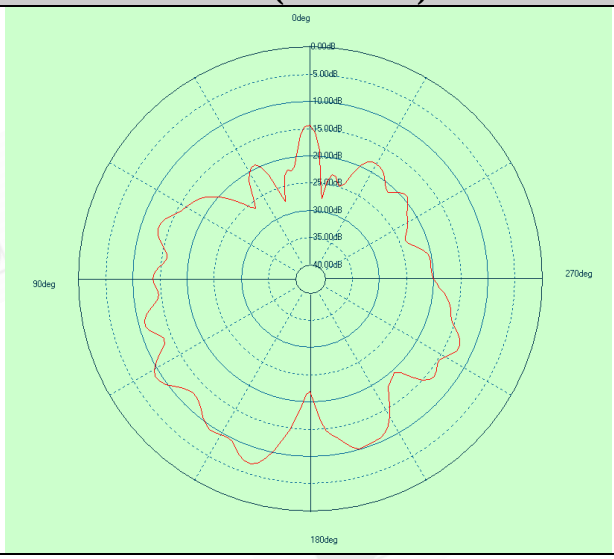
Free Space GAIN TOTAL (2480MHz) - 3D	Free Space GAIN TOTAL (2480MHz) – XY cut
	
Free Space GAIN TOTAL (2480MHz) – XZ cut	**Free Space GAIN TOTAL (2480MHz) – YZ cut**
	

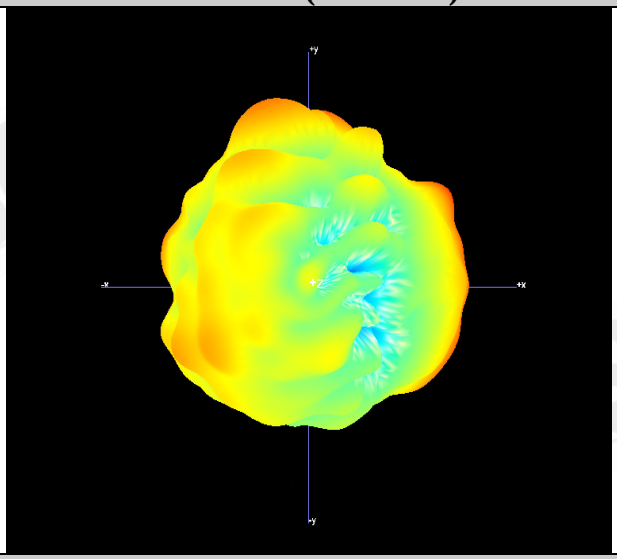
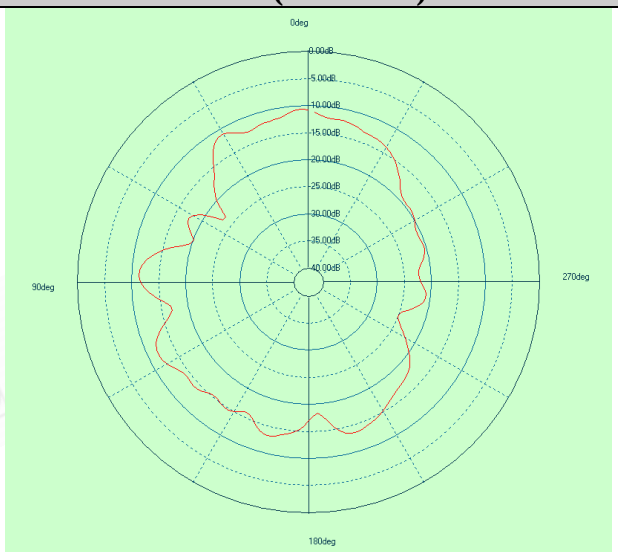
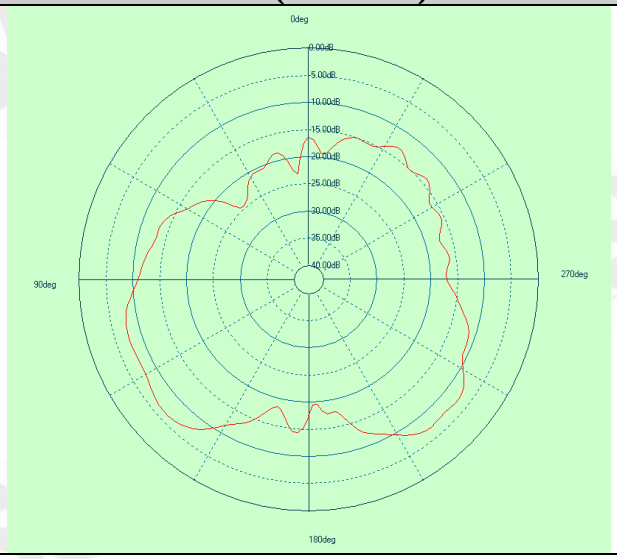
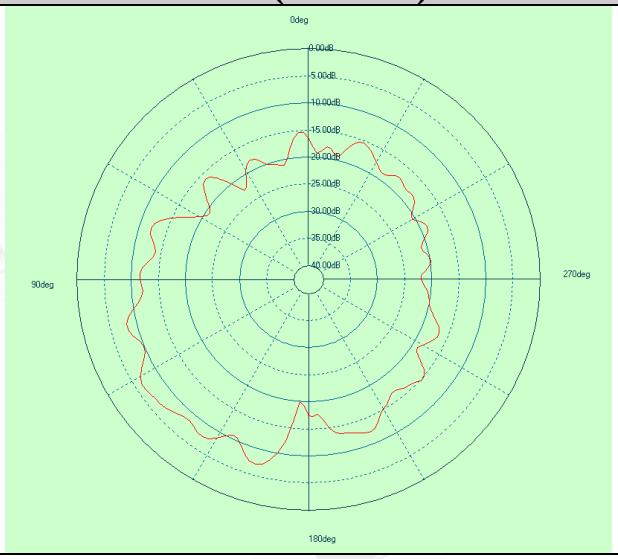
Free Space GAIN TOTAL (5240MHz) - 3D	Free Space GAIN TOTAL (5240MHz) – XY cut
	
Free Space GAIN TOTAL (5240MHz) – XZ cut	**Free Space GAIN TOTAL (5240MHz) – YZ cut**
	

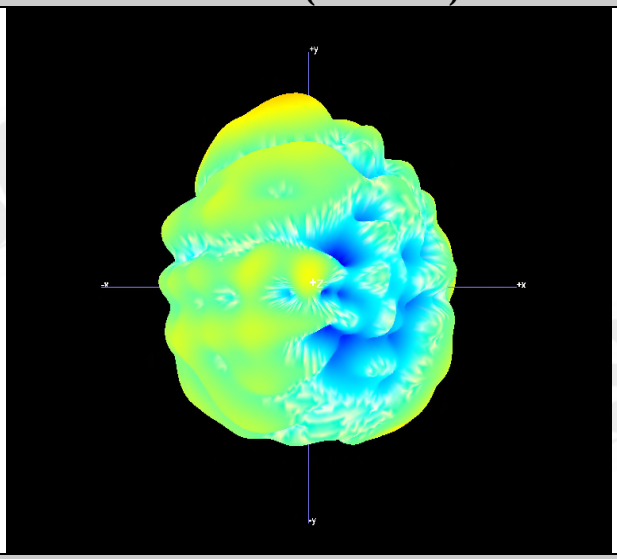
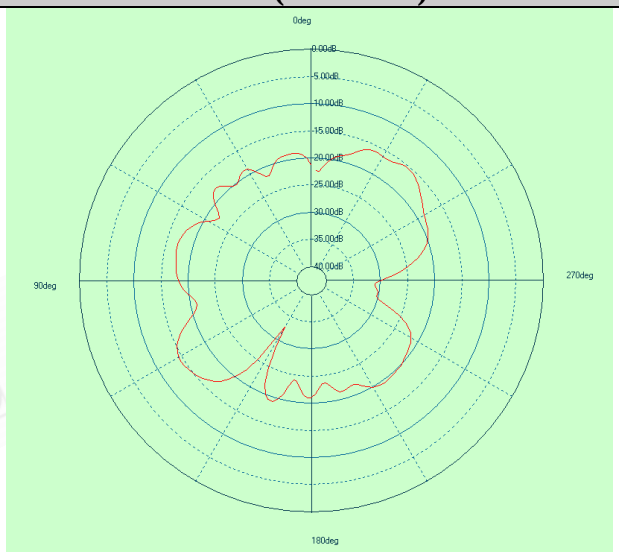
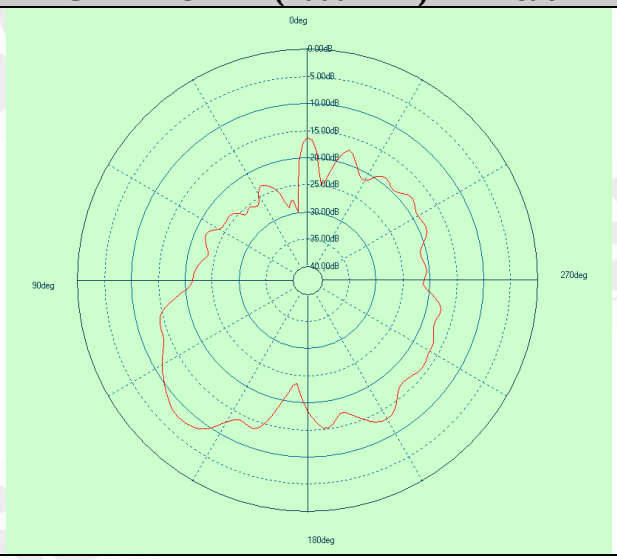
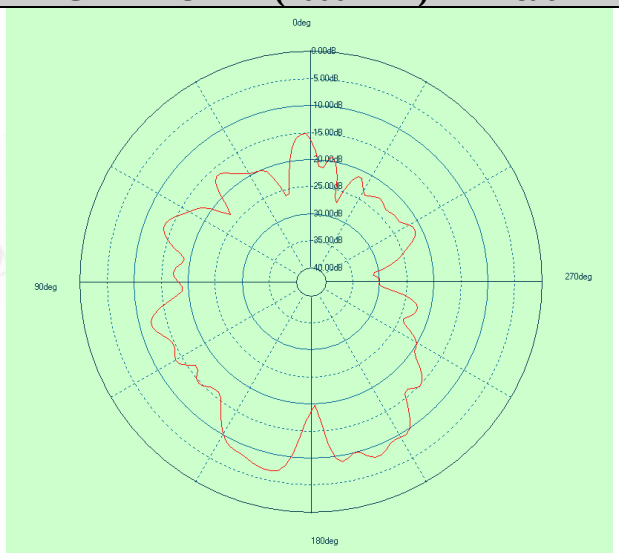
Free Space GAIN TOTAL (5600MHz) - 3D	Free Space GAIN TOTAL (5600MHz) – XY cut
	
Free Space GAIN TOTAL (5600MHz) – XZ cut	**Free Space GAIN TOTAL (5600MHz) – YZ cut**
	

Free Space GAIN TOTAL (5800MHz) - 3D	Free Space GAIN TOTAL (5800MHz) – XY cut
	
Free Space GAIN TOTAL (5800MHz) – XZ cut	**Free Space GAIN TOTAL (5800MHz) – YZ cut**
	

Free Space GAIN TOTAL (6175MHz) - 3D	Free Space GAIN TOTAL (6175MHz) – XY cut
	
Free Space GAIN TOTAL (6175MHz) – XZ cut	**Free Space GAIN TOTAL (6175MHz) – YZ cut**
	

Free Space GAIN TOTAL (6475MHz) - 3D	Free Space GAIN TOTAL (6475MHz) – XY cut
	
Free Space GAIN TOTAL (6475MHz) – XZ cut	**Free Space GAIN TOTAL (6475MHz) – YZ cut**
	

Free Space GAIN TOTAL (6760MHz) - 3D	Free Space GAIN TOTAL (6760MHz) – XY cut
	
Free Space GAIN TOTAL (6760MHz) – XZ cut	**Free Space GAIN TOTAL (6760MHz) – YZ cut**
	

Free Space GAIN TOTAL (7000MHz) - 3D	Free Space GAIN TOTAL (7000MHz) – XY cut
	
Free Space GAIN TOTAL (7000MHz) – XZ cut	**Free Space GAIN TOTAL (7000MHz) – YZ cut**
	

End of Report