

Antenna Test Report

Report No.: TEOT2303000159E4

Applicant Name: 羅技電子股份有限公司

Manufacturer Name: 富智康國際股份有限公司(鴻海集團)

Product Name: Tiny



Model Number: VR0034

Measurements performed at

SGS Taiwan Ltd.

Hwaya District, Taiwan

Issued Date: March 09, 2023

	Name	Date & Signature	Distribution
Prepared by:	Nandi Chen Sr. Engineer	 March 09, 2023	
Approved by:	Shawn Yen Supervisor	 March 09, 2023	



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1. Measurement System Information

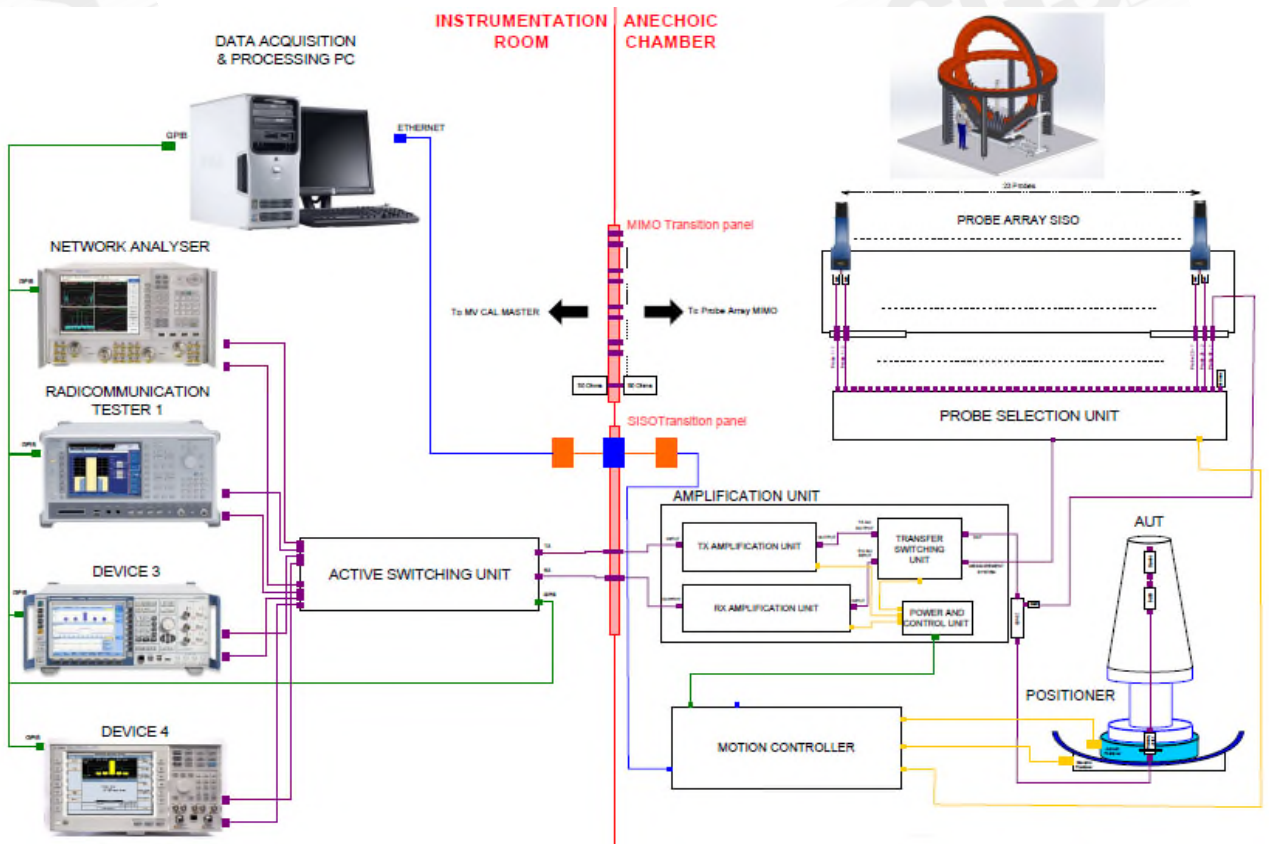
1.1 General Information

Testing Condition:

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

Measurement Facility:

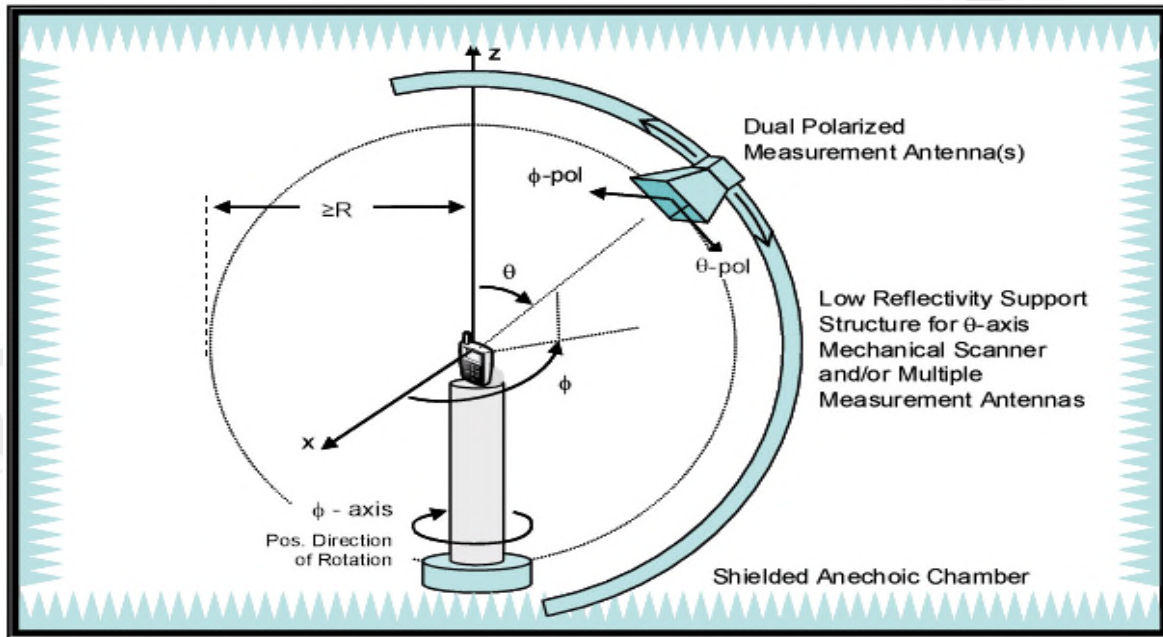
- Measurement Chamber: MVG 3D fully anechoic chamber and its measuring system (Stargate-24-L)
- Base Station Simulator: Anritsu MT8820C (or R&S CMU200)
- Network Analyzer: Agilent E5071C



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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 DUT is placed on top of the pedestal, in the center of the system.

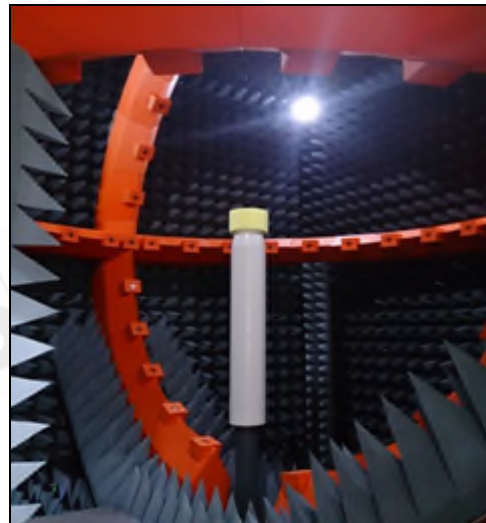
Typical Setup for MVG Stargate-24-L:



Instruments View



Inside View



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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:	LOGITECH FAR EAST LTD.
Applicant's address:	#2 Creation Rd. 4, Science-Based Ind. Park Hsinchu Taiwan, R.O.C.
Contact person:	Christie Chang
Telephone:	03-612-2518
Fax:	NA
E-mail:	cchang4@logitech.com

Details of Manufacturer:

Manufacturer's name:	FIH CO., LTD.
Manufacturer's address:	No. 4, Minsheng St., Tucheng Dist., New Taipei City 23679, Taiwan (R.O.C.)
Contact person:	BrianWu
Telephone:	02-2268-5511 #62087
Fax:	NA
E-mail:	BrianWu@fih-foxconn.com

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Details of EUT:

Device Description:	Tiny
Device Manufacturer:	LOGITECH FAR EAST LTD.
Device Model:	VR0034
Hardware Version:	N/A
Software Version:	N/A
Frequency Range:	2400MHz ~ 2500MHz, Step 10 MHz 5000MHz ~ 6000MHz, Step 20 MHz
Antenna Type:	Dipole Antenna
Antenna Connector:	ipex (MHF)
Cable Length:	WLAN ANT0: 122.0+/-1.0mm WLAN ANT1: 77.0+/-1.0mm BT: 87+/-1.0 mm

Duration of Tests:

Sample Receive Date:	2023-01-18
Test Starting Date:	2023-01-30
Test Ending Date:	2023-01-30
Report Issued Date:	2023-03-09

1.2 List of Equipment

Equipment Summary Sheet

Equipment Description	Manufacturer	Identification no.	Current calibration date	Next calibration date
Universal Radio Communication tester	Anritsu	MT8820C	2022/10/12	2023/10/11
Network Analyzer	Agilent	E5071C	2023/01/16	2024/01/15
Sleeve Dipole	MVG	SD740	2022/01/07	2025/01/06
Dual Ridge Horn	MVG	SH800	2022/11/25	2023/11/24
Stargate-24-L probe array	MVG	Stargate-24-L	2022/08/26	2023/08/25
Measurement software	MVG	SPM V1.9	N/A	N/A

MVG Chamber Information

Items	Performances
Frequency Range	600MHz ~ 10GHz
Ripple & QZ size Max EUT Weight	< 1.0dB & 50cm 6kg
Measurement Uncertainty	< 2.0dB @ 95% confidence level
Measurement Distance	1.6 m by radius with SISO(V): 24 probes MIMO(H): 32 probes
Anechoic Chamber	L*W*H = 5.0*5.0*5.0 m outside dimension

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3. Test Procedure

Passive Gain Calibration:

1. Position MVG golden dipole antenna to test turn table.
2. Leave the chamber and close door.
3. Run measurement software (SPM V1.9).
4. Check the test data with golden dipole gain table.
5. Correction path loss.

Antenna Gain Measurement:

1. Position the DUT to test turn table.
2. Connect the extend RF cable.
3. Record the coordinates and take picture of DUT setup.
4. Leave the chamber and close door.
5. Run measurement software (SPM V1.9).
6. Record the test data.

4. Summation Test Reports

4.1 Antenna Gain and Efficiency

WiFi 0									
Freq(MHz)	Peak Gain. dBi	Efficiency	Average . dBi	Freq(MHz)	Peak Gain. dBi	Efficiency	Average . dBi	Freq(MHz)	Peak Gain. dBi
2400.00	5.01	72.00%	-1.43	5400.00	4.83	65.32%	-1.85	5400.00	4.83
2410.00	5.26	74.57%	-1.27	5420.00	4.15	59.51%	-2.25	5420.00	4.15
2420.00	5.50	77.42%	-1.11	5440.00	4.47	65.47%	-1.84	5440.00	4.47
2430.00	5.49	77.02%	-1.13	5460.00	4.79	66.48%	-1.77	5460.00	4.79
2440.00	5.26	74.52%	-1.28	5480.00	5.17	67.26%	-1.72	5480.00	5.17
2450.00	5.15	73.31%	-1.35	5500.00	5.16	65.82%	-1.82	5500.00	5.16
2460.00	5.14	72.65%	-1.39	5520.00	5.38	64.05%	-1.93	5520.00	5.38
2470.00	4.91	70.41%	-1.52	5540.00	5.89	69.89%	-1.56	5540.00	5.89
2480.00	4.55	67.71%	-1.69	5560.00	5.85	66.67%	-1.76	5560.00	5.85
2490.00	4.22	65.05%	-1.87	5580.00	5.79	65.56%	-1.83	5580.00	5.79
2500.00	3.84	61.91%	-2.08	5600.00	5.60	62.69%	-2.03	5600.00	5.60
5000.00	4.68	60.73%	-2.17	5620.00	5.74	62.43%	-2.05	5620.00	5.74
5020.00	4.82	61.21%	-2.13	5640.00	5.75	64.94%	-1.87	5640.00	5.75
5040.00	4.49	57.43%	-2.41	5660.00	5.60	65.67%	-1.83	5660.00	5.60
5060.00	4.82	61.48%	-2.11	5680.00	5.50	65.34%	-1.85	5680.00	5.50
5080.00	4.57	57.65%	-2.39	5700.00	5.75	66.39%	-1.78	5700.00	5.75
5100.00	4.34	55.01%	-2.60	5720.00	5.70	64.12%	-1.93	5720.00	5.70
5120.00	4.61	58.53%	-2.33	5740.00	5.85	65.14%	-1.86	5740.00	5.85
5140.00	4.47	55.78%	-2.53	5760.00	5.81	64.88%	-1.88	5760.00	5.81
5160.00	4.75	59.99%	-2.22	5780.00	5.85	64.49%	-1.90	5780.00	5.85
5180.00	4.78	58.80%	-2.31	5800.00	5.81	65.49%	-1.84	5800.00	5.81
5200.00	4.76	58.40%	-2.34	5820.00	5.82	67.22%	-1.72	5820.00	5.82
5220.00	4.98	63.42%	-1.98	5840.00	5.56	62.29%	-2.06	5840.00	5.56
5240.00	4.89	60.99%	-2.15	5860.00	5.86	62.50%	-2.04	5860.00	5.86
5260.00	4.75	59.98%	-2.22	5880.00	5.86	63.94%	-1.94	5880.00	5.86
5280.00	4.94	62.19%	-2.06	5900.00	5.61	59.59%	-2.25	5900.00	5.61
5300.00	4.74	59.31%	-2.27	5920.00	5.23	56.69%	-2.46	5920.00	5.23
5320.00	4.88	62.97%	-2.01	5940.00	5.07	53.38%	-2.73	5940.00	5.07
5340.00	4.85	61.97%	-2.08	5960.00	5.38	57.57%	-2.40	5960.00	5.38
5360.00	5.00	65.46%	-1.84	5980.00	5.44	59.29%	-2.27	5980.00	5.44
5380.00	4.93	66.45%	-1.77	6000.00	5.21	54.80%	-2.61	6000.00	5.21

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WiFi 1							
Freq(MHz)	Peak Gain. dBi	Efficiency	Average . dBi	Freq(MHz)	Peak Gain. dBi	Efficiency	Average . dBi
2400.00	5.70	84.35%	-0.74	5400.00	4.97	54.01%	-2.68
2410.00	5.76	84.25%	-0.74	5420.00	4.61	50.75%	-2.95
2420.00	5.76	87.03%	-0.60	5440.00	5.18	57.61%	-2.39
2430.00	5.73	87.22%	-0.59	5460.00	5.33	60.33%	-2.19
2440.00	5.49	81.90%	-0.87	5480.00	5.27	59.53%	-2.25
2450.00	5.29	79.74%	-0.98	5500.00	4.92	57.40%	-2.41
2460.00	5.27	79.39%	-1.00	5520.00	5.15	59.85%	-2.23
2470.00	5.13	76.60%	-1.16	5540.00	5.17	66.79%	-1.75
2480.00	5.07	76.25%	-1.18	5560.00	5.01	65.18%	-1.86
2490.00	5.02	76.96%	-1.14	5580.00	5.33	63.65%	-1.96
2500.00	4.60	72.71%	-1.38	5600.00	5.38	61.35%	-2.12
5000.00	5.30	62.83%	-2.02	5620.00	5.58	63.31%	-1.99
5020.00	5.89	66.03%	-1.80	5640.00	4.80	66.24%	-1.79
5040.00	5.83	62.01%	-2.08	5660.00	5.04	67.54%	-1.70
5060.00	5.82	64.26%	-1.92	5680.00	4.82	66.91%	-1.75
5080.00	5.83	60.81%	-2.16	5700.00	4.95	68.08%	-1.67
5100.00	5.77	60.36%	-2.19	5720.00	5.04	64.33%	-1.92
5120.00	5.76	62.80%	-2.02	5740.00	5.56	64.87%	-1.88
5140.00	5.35	55.71%	-2.54	5760.00	5.66	65.03%	-1.87
5160.00	5.83	61.62%	-2.10	5780.00	5.45	64.14%	-1.93
5180.00	5.77	60.83%	-2.16	5800.00	5.38	63.24%	-1.99
5200.00	5.52	59.18%	-2.28	5820.00	5.33	61.00%	-2.15
5220.00	5.69	61.34%	-2.12	5840.00	5.22	59.37%	-2.26
5240.00	5.12	56.17%	-2.50	5860.00	5.17	58.41%	-2.34
5260.00	5.13	57.43%	-2.41	5880.00	5.29	59.29%	-2.27
5280.00	5.19	59.05%	-2.29	5900.00	4.96	53.43%	-2.72
5300.00	4.38	51.99%	-2.84	5920.00	4.54	49.56%	-3.05
5320.00	4.66	54.00%	-2.68	5940.00	4.54	49.37%	-3.07
5340.00	5.05	53.75%	-2.70	5960.00	4.78	52.40%	-2.81
5360.00	5.03	57.35%	-2.41	5980.00	4.91	52.13%	-2.83
5380.00	5.34	58.40%	-2.34	6000.00	4.34	46.18%	-3.36

BT			
Freq(MHz)	Peak Gain. dBi	Efficiency	Average . dBi
2400.00	3.48	64.30%	-1.92
2410.00	3.16	64.56%	-1.90
2420.00	3.30	68.71%	-1.63
2430.00	3.35	72.27%	-1.41
2440.00	2.79	67.55%	-1.70
2450.00	2.27	64.58%	-1.90
2460.00	2.18	64.11%	-1.93
2470.00	2.04	61.60%	-2.10
2480.00	1.88	61.56%	-2.11
2490.00	1.82	62.86%	-2.02
2500.00	1.96	61.57%	-2.11

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4.2 Summary Table of Antenna Peak Gain

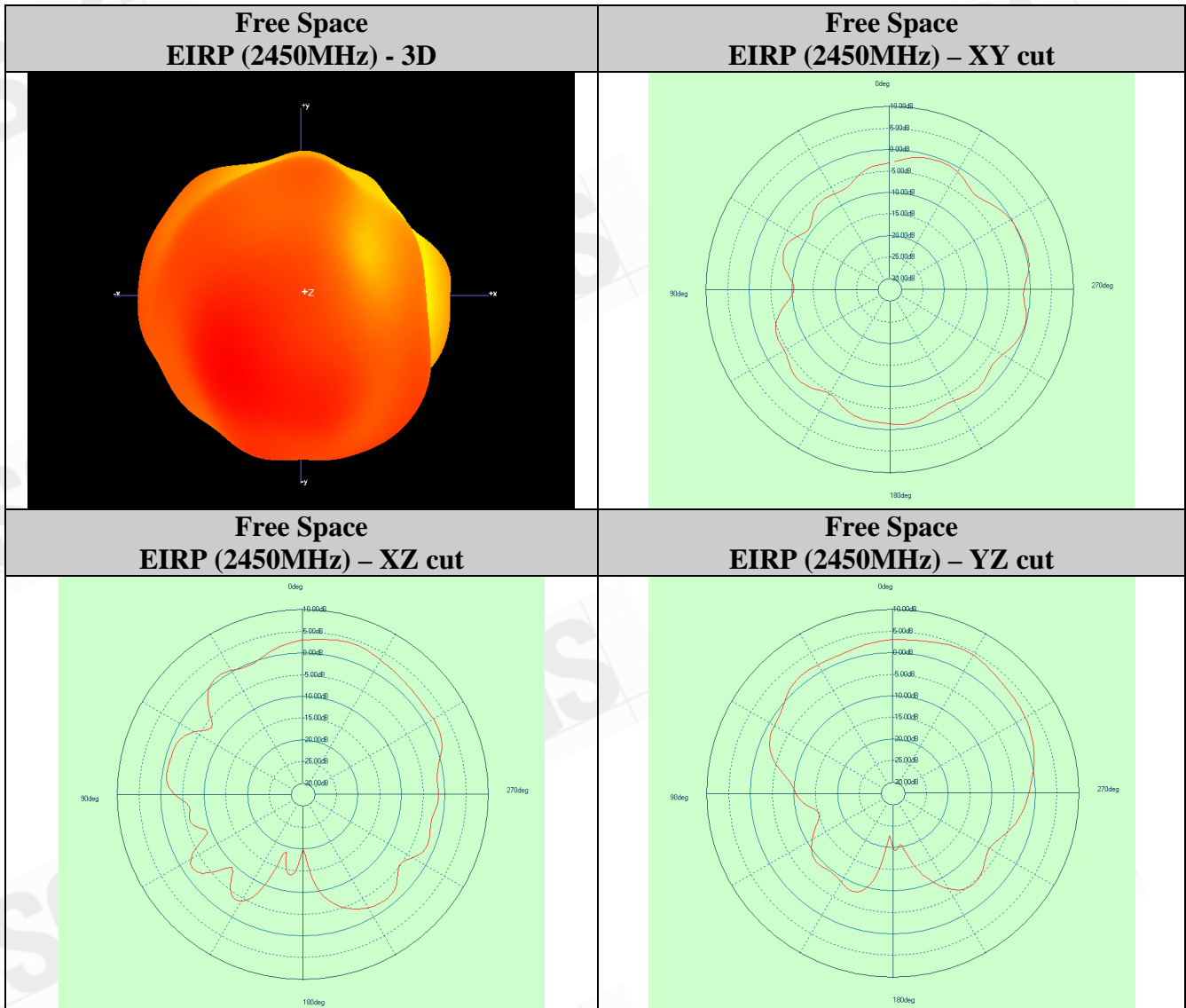
	2GHz	5GHz (Band I) (5180~5240 MHz)	5GHz (Band II) (5260~5320 MHz)	5GHz (Band III) (5500~5720 MHz)	5GHz (Band IV) (5745~5825 MHz)
WIFI 0	5.50 dBi	4.98 dBi	4.94 dBi	5.89 dBi	5.85 dBi
WIFI 1	5.76 dBi	5.77 dBi	5.19 dBi	5.58 dBi	5.66 dBi
Bluetooth	3.48 dBi	NA	NA	NA	NA

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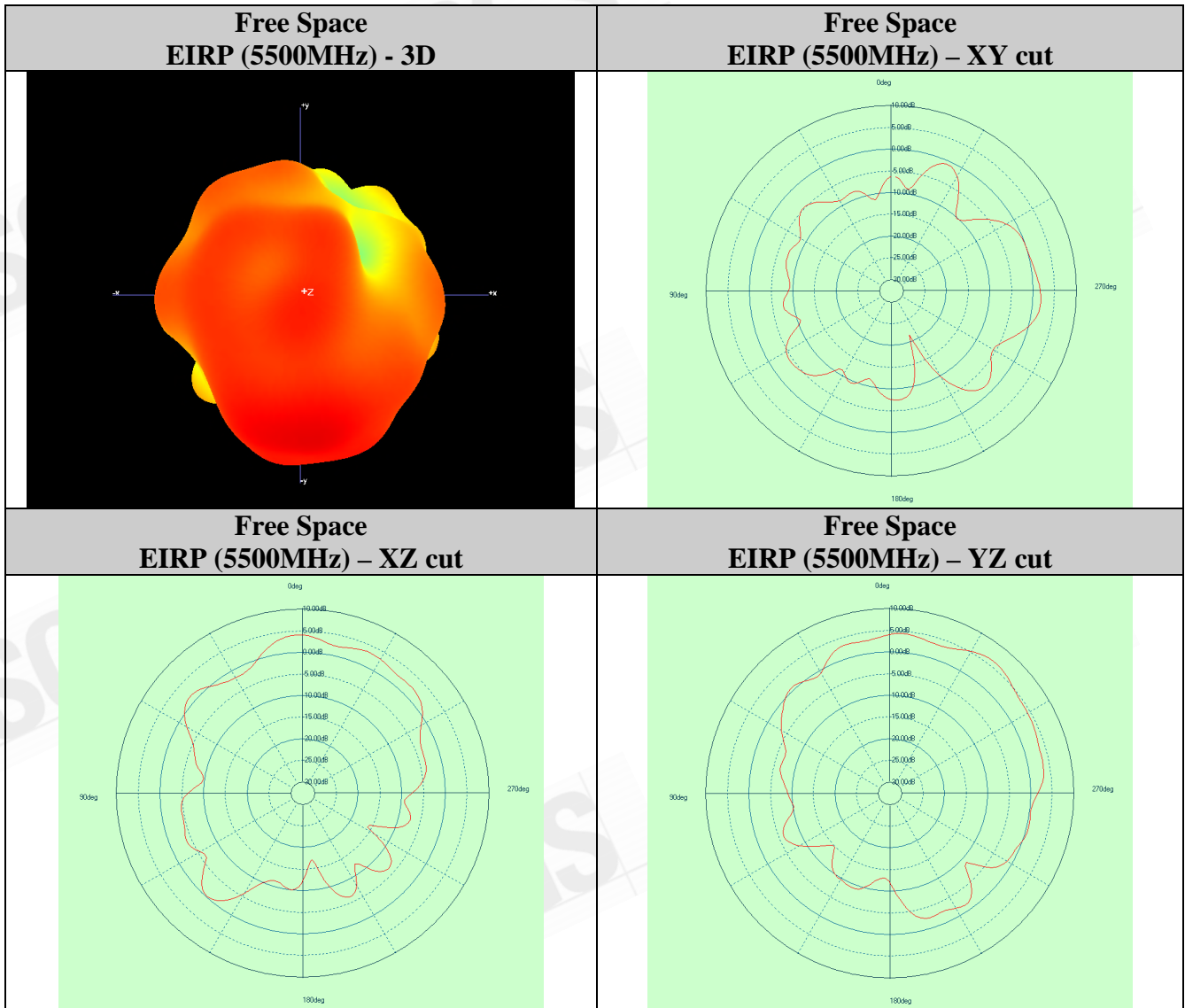
4.3 Antenna 3D Plot Matrix

All plots in this section show the total EIRP ($EIRP_{\theta} + EIRP_{\phi}$) with the +x-axis pointing right, +y-axis pointing up, and +z-axis pointing out of the page.

WiFi 0 Antenna

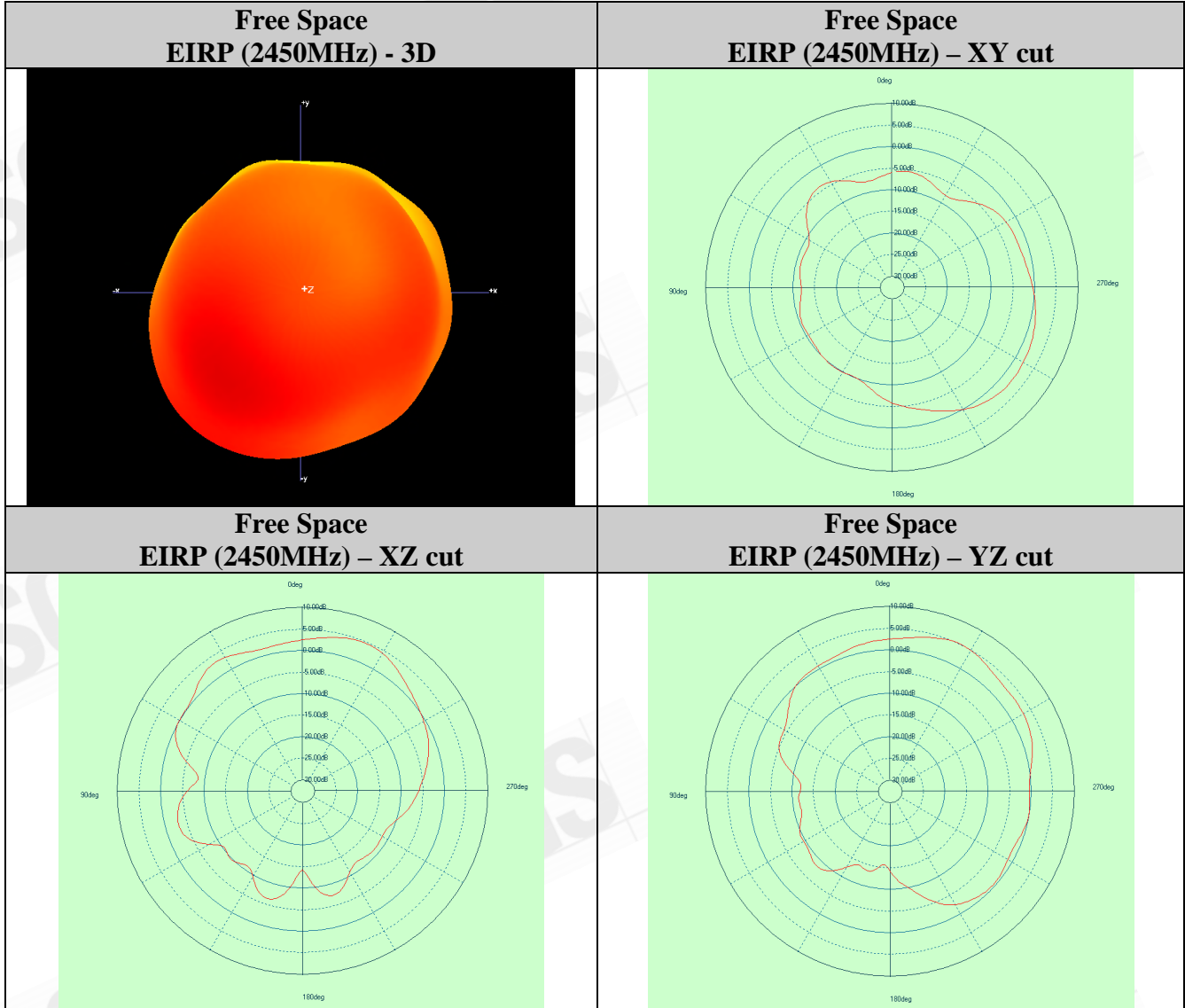


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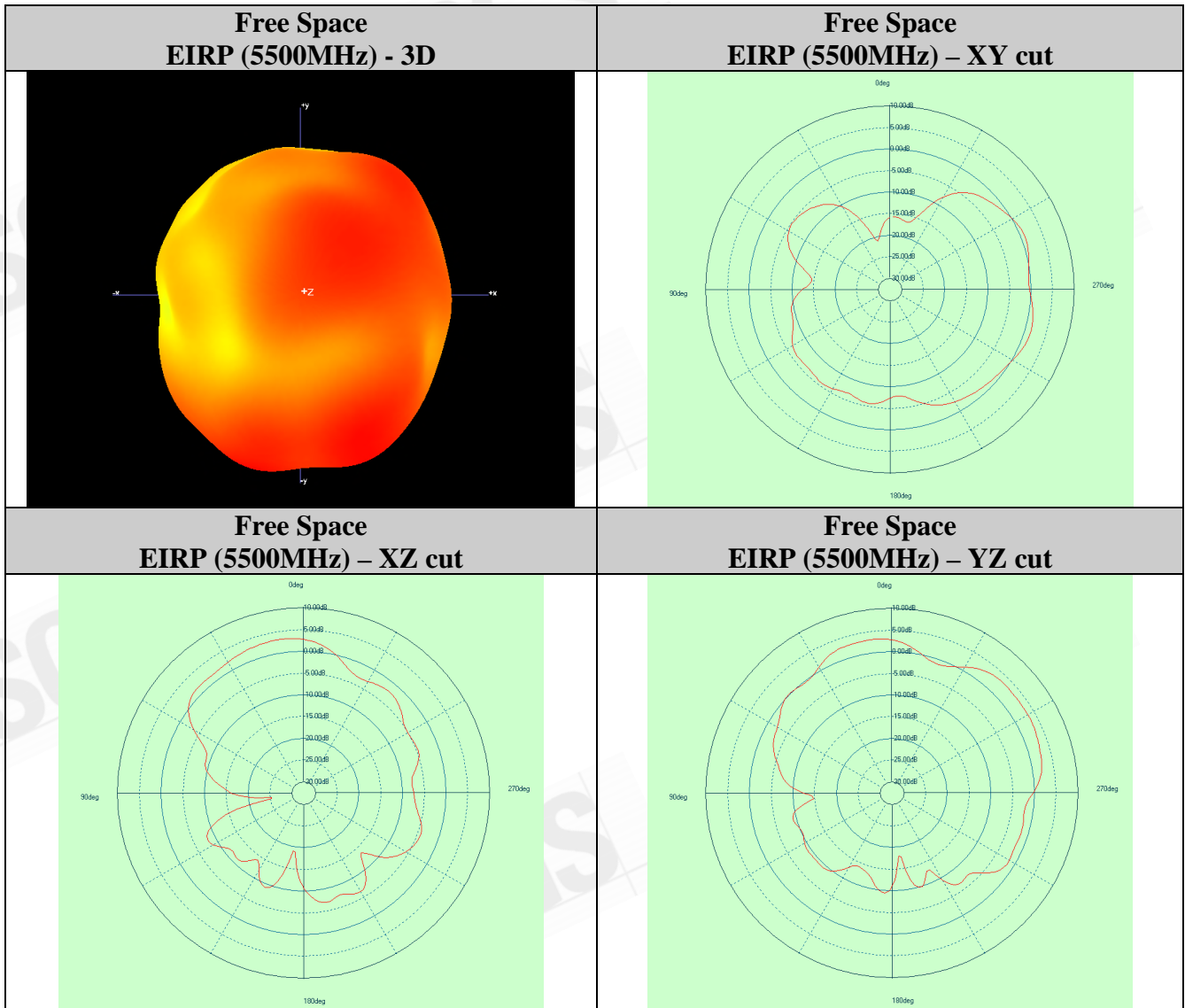


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WiFi 1 Antenna

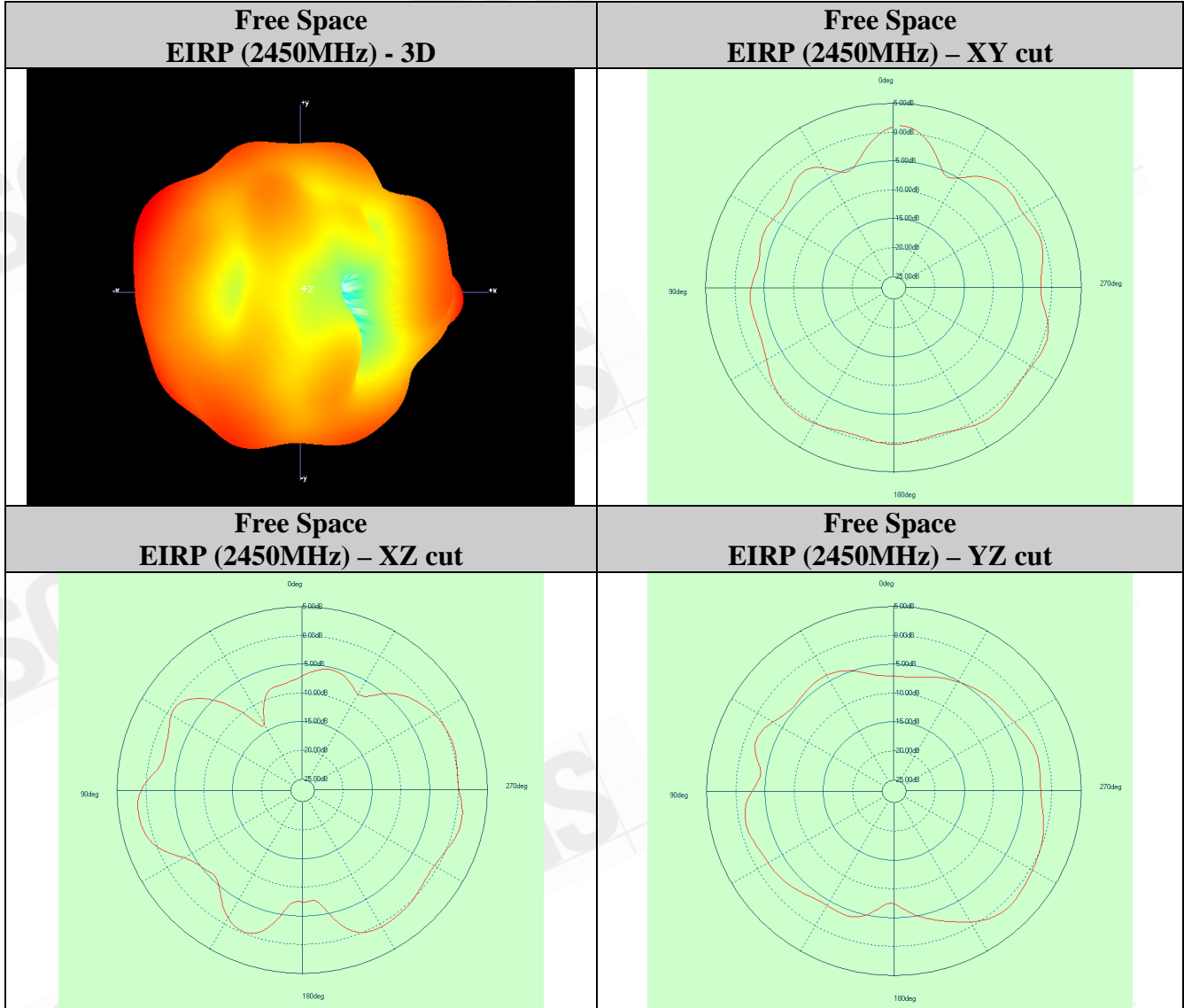


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BT Antenna



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5. Test Setup

see the separated setup document

Front View

Side View

End of Report

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