Logitech

Antenna Under Test (AUT)

Report

Report No.: EVT-700-006527

Model Name: YR0076

Equipment Type: Keyboard

Manufacturer: Logitech Far East LTD.

Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City, Taiwan

Tested by: Danny Chen / Tobey Chen

Report Date: 2024/03/19

Report Release History

Report version	Description	Date Issued
YR0076 AUT Report	Original release	2024/03/19

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1. EUT Antenna Information

1) Antenna Material：Ceramic Chip Antenna
2) Antenna Type： PIFA mode
3) Antenna Dimension: 3.2 x 1.6 x 1.2 mm
4) Operating Frequency：2.4 GHz - 2.4835 GHz
5) Input Impedance：50 Ω
6) Standing-Wave Ratio：2:1

2. Measured Values and Calculation of Antenna Gains

Measure peak horizontal/vertical EIRP on each x-y, y-z, x-z plane. The highest measured values will be used to calculate the antenna peak gain.

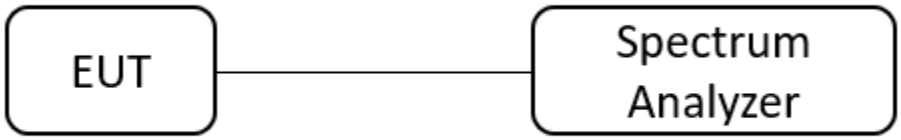
Antenna Peak Gain (dBi) = Max EIRP(dBm) - Conducted Power (dBm)

Frequency	X-Y Plane ϕ=0~360º, θ=90º		X-Z Plane ϕ=0º, θ=0~360º		Y-Z Plane ϕ=90º, θ=0~360º		Max Peak EIRP (dBm)	Conducted Power (dBm)	Antenna Peak Gain (dBi)
	Ver. Peak EIRP (dBm)	Hori. Peak EIRP (dBm)	Ver. Peak EIRP (dBm)	Hori. Peak EIRP (dBm)	Ver. Peak EIRP (dBm)	Hori. Peak EIRP (dBm)			
2403	-1.61	9.02	7.92	8.94	6.51	1.62	9.02	4.03	4.99
2442	-2.52	8.23	6.28	8.49	5.77	2.2	8.23	4.17	4.06
2479	-3.74	6.84	4.82	7.71	4.61	1.52	6.84	4.58	2.26

Test Date: 2024/03/13

3. RF Conducted Power Measurement

3.1 Test Setup



3.2 Test Instruments

Description	Model No.	Serial No.	Last Calibration
Spectrum Analyzer Keysight	N9010B	MY63440332	2022/12/20

Note: The calibration interval of the above test instruments is __24__ months

3.3 Test Procedure

A spectrum analyzer or Power meter was used to perform output power measurement, setting the detector to average and configuring EUT continuously transmitting power(100% duty cycle).

3.4 Test Result of RF conducted Power

Frequency (MHz)	Measured Power (dBm)
2403	4.03
2442	4.17
2479	4.58

Test Date: 2024/03/19

4. 2D Radiation Pattern Measurement

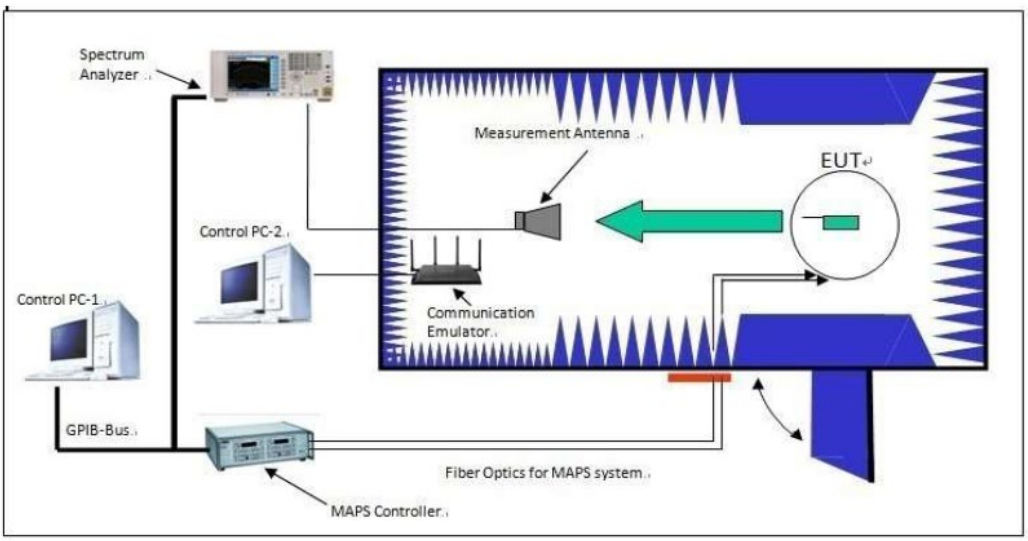
4.1 Test Location

2D radiation pattern measurement in the anechoic chamber

4.2 Description of the anechoic chamber

Anechoic Chamber

- Length: 10m
- Width: 5m
- Height: 5m
- Turntable height: 1.5m
- Measurement Antenna height: 1.5m



4.3 Test Instruments

Description	Model No.	Serial No.	Last Calibration
Spectrum Analyzer Keysight	N9030A	MY55330160	2024/01/31
Horn Antenna ETS	BBHA 9120 D	124	2023/11/12

Software	Antenna Pattern V6.3	N/A	N/A
Antenna Tower/ Turntable	MF-7802	MF780208411	N/A
PSG analog signal generator (from 250 kHz to 50 GHz) Keysight	E8257D	MY53401987	2023/6/14
RF Coaxial Cable	EMC102-KM-KM-1000	160202R	2023/06/02

Note: The calibration interval of the above test instruments is __12__ months

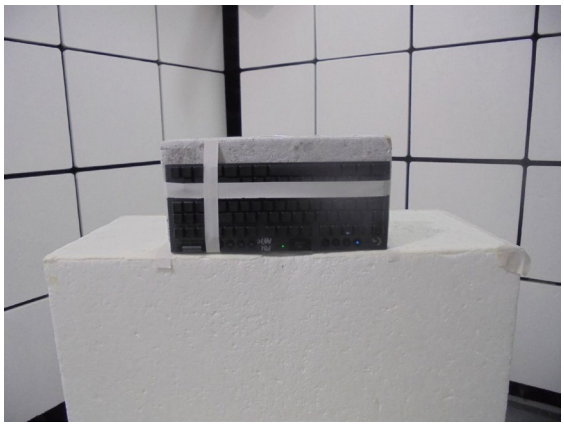
4.4 Test Procedure

i. Connect the EUT to power meter and record the power setting of EUT and the measured conducted power.
ii. Fasten the EUT in the center of the turntable, record the coordinates and take pictures.
iii. Configuring EUT continuously transmitting (100% duty cycle).
iv. Make sure the transmit signal is stable and at the maximum RF power level.
v. Setup the channel power function by spectrum analyzer.
vi. Read the power level on the spectrum analyzer and record in the following positions.
    1. The turntable is then stepped between 0 to 360 degrees along the horizontal plane in 1-degree increments.
    2. Data is recorded using the spectrum analyzer for both theta and phi polarizations at each position.
vii. Rotate the EUT with 90 degrees and repeat step f.1 and step f.2 until all 3 planes(X-Y,X-Z,Y-Z) were measured.
viii. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Raw Value”. Record the power level of S.G.
    EIRP = $P_{SigGen} + G_T – L_C$
    where:
    P_{SigGen} = power setting of the signal generator that produces the same received power reading as the DUT, in dBm;
    G_T = gain of the substitute antenna, in dBd (ERP) or dBi (EIRP);
    L^C = signal loss in the cable connecting the signal generator to the substitute antenna, in dB

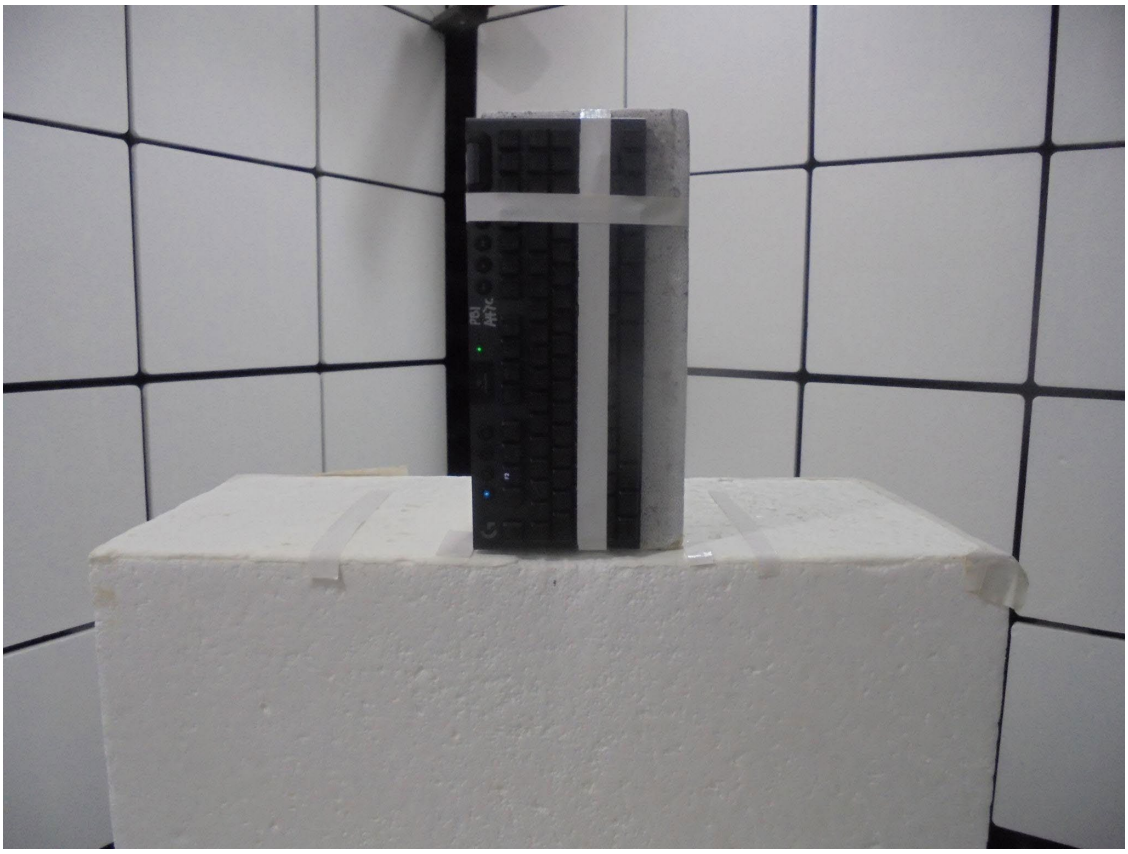
ix. Antenna Peak Gain (dBi) = Max EIRP(dBm) - Conducted Power (dBm)

4.5 Test Setup photos

X-Y plane



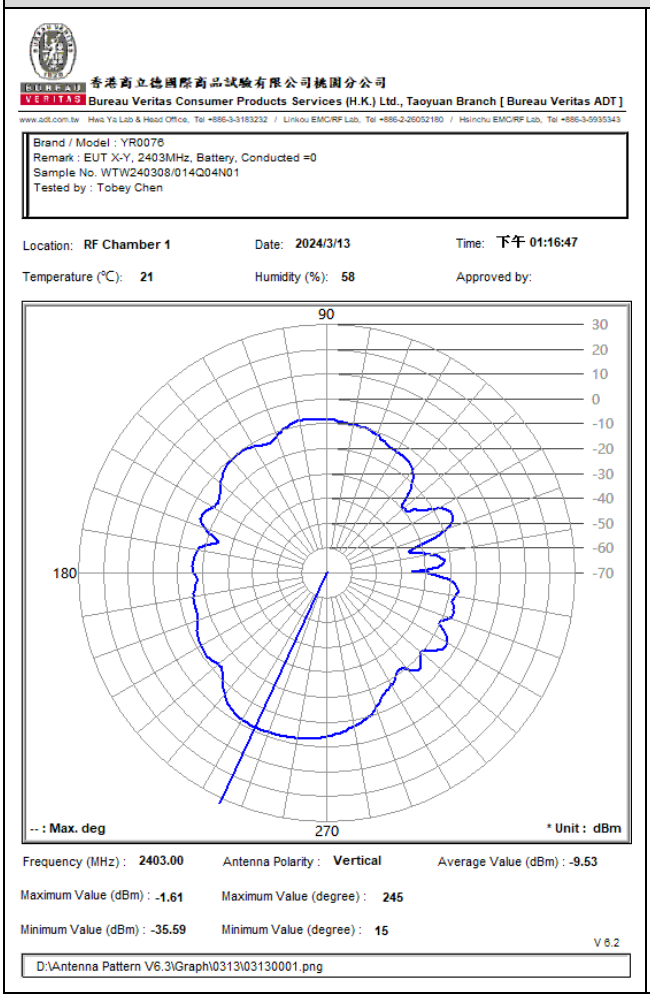
X-Z plane

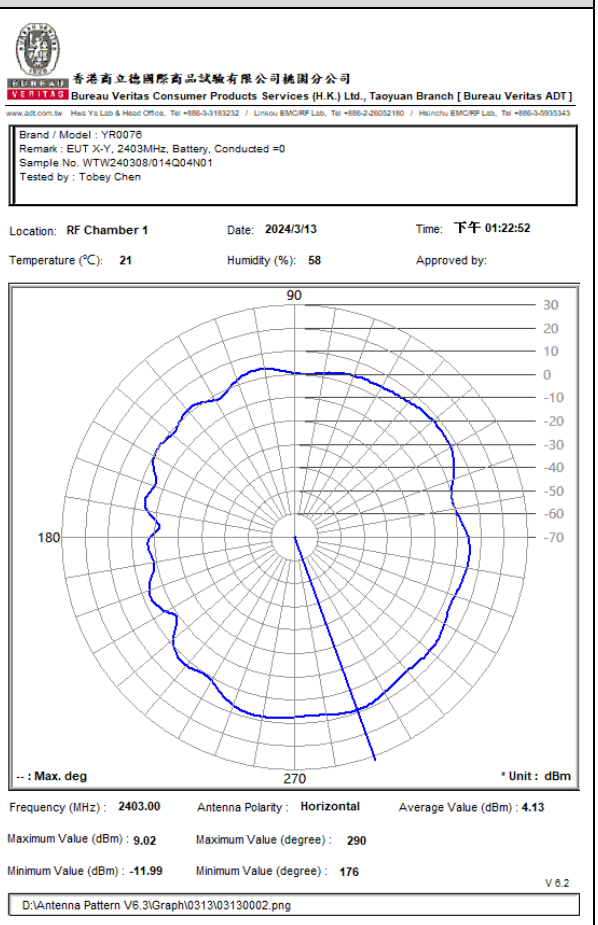


Y-Z plane

4.6 2D Pattern Test Plot

X-Y Plane





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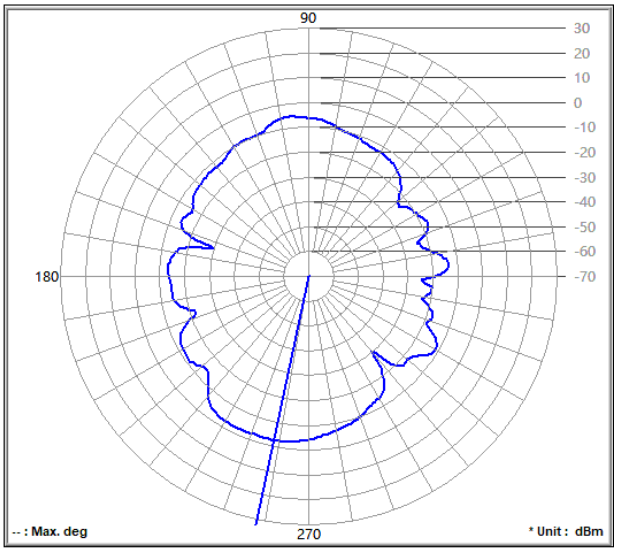
Brand / Model : YR0076
Remark : EUT X-Y, 2442MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen

Location: **RF Chamber 1** Date: **2024/3/13** Time: **下午 01:31:07**

Temperature (℃): **21** Humidity (%): **58** Approved by:



Frequency (MHz) : **2442.00** Antenna Polarity : **Vertical** Average Value (dBm) : **-9.38**

Maximum Value (dBm) : **-2.52** Maximum Value (degree) : **258**

Minimum Value (dBm) : **-30.60** Minimum Value (degree) : **310**

V 6.2

D:\Antenna Pattern V6.3\Graph\0313\03130003.png

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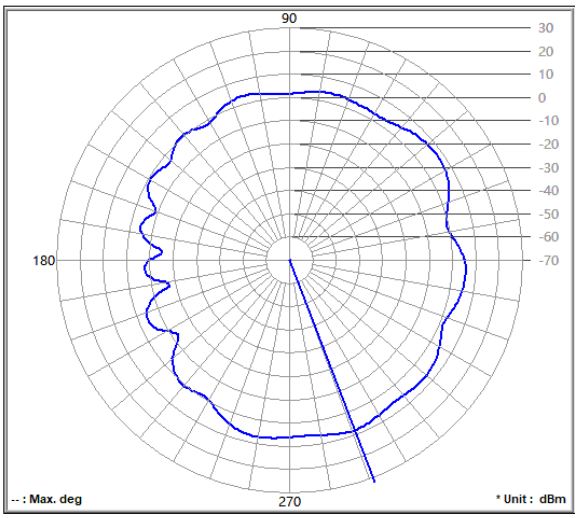
Brand / Model : YR0076
Remark : EUT X-Y, 2442MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen

Location: **RF Chamber 1** Date: **2024/3/13** Time: **下午 01:39:04**

Temperature (℃): **21** Humidity (%): **58** Approved by:



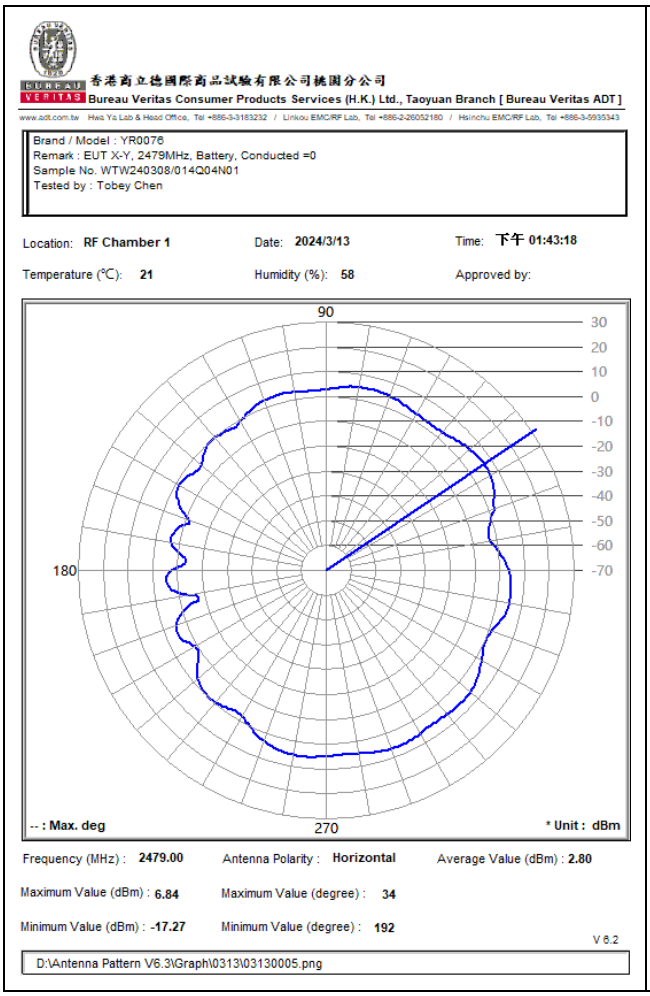
Frequency (MHz) : **2442.00** Antenna Polarity : **Horizontal** Average Value (dBm) : **3.61**

Maximum Value (dBm) : **8.23** Maximum Value (degree) : **291**

Minimum Value (dBm) : **-17.31** Minimum Value (degree) : **192**

V 6.2

D:\Antenna Pattern V6.3\Graph\0313\03130004.png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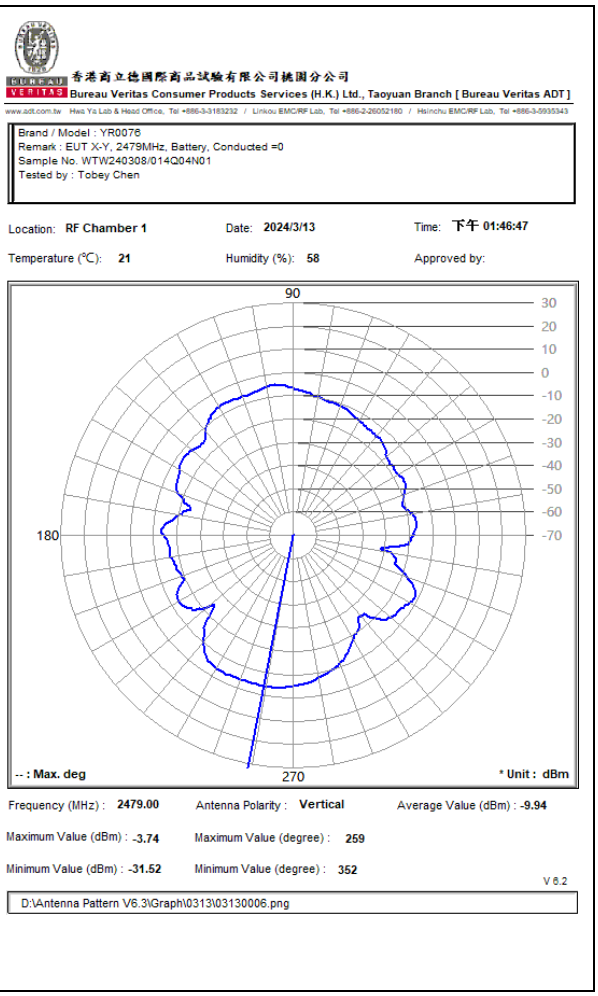
Brand / Model : YR0076
Remark : EUT X-Y, 2479MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen
Location: RF Chamber 1
Date: 2024/3/13
Time: 下午 01:43:18
Temperature (℃): 21
Humidity (%): 58
Approved by:
90
180
270
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-- : Max. deg
* Unit : dBm
Frequency (MHz) : 2479.00
Antenna Polarity : Horizontal
Average Value (dBm) : 2.80
Maximum Value (dBm) : 6.84
Maximum Value (degree) : 34
Minimum Value (dBm) : -17.27
Minimum Value (degree) : 192
V 6.2
D:\Antenna Pattern V6.3\Graph\0313\03130005.png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Brand / Model : YR0076
Remark : EUT X-Y, 2479MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen
Location: RF Chamber 1
Date: 2024/3/13
Time: 下午 01:46:47
Temperature (℃): 21
Humidity (%): 58
Approved by:
90
180
270
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-- : Max. deg
* Unit : dBm
Frequency (MHz) : 2479.00
Antenna Polarity : Vertical
Average Value (dBm) : -9.94
Maximum Value (dBm) : -3.74
Maximum Value (degree) : 259
Minimum Value (dBm) : -31.52
Minimum Value (degree) : 352
V 6.2
D:\Antenna Pattern V6.3\Graph\0313\03130006.png

X-Z Plane

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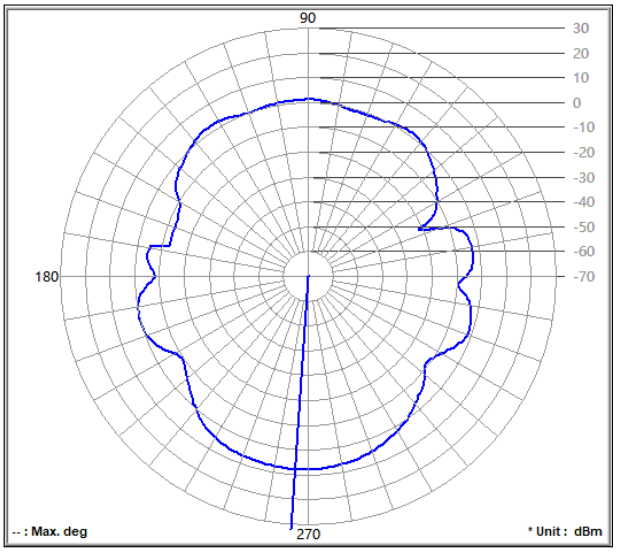
Brand / Model : YR0076
Remark : EUT X-Z, 2403MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen

Location: **RF Chamber 1** Date: **2024/3/13** Time: **下午 02:01:36**

Temperature (℃): **21** Humidity (%): **58** Approved by:



Frequency (MHz) : **2403.00** Antenna Polarity : **Vertical** Average Value (dBm) : **1.22**

Maximum Value (dBm) : **7.92** Maximum Value (degree) : **266**

Minimum Value (dBm) : **-21.79** Minimum Value (degree) : **23**

V 6.2

D:\Antenna Pattern V6.3\Graph\0313\03130007.png

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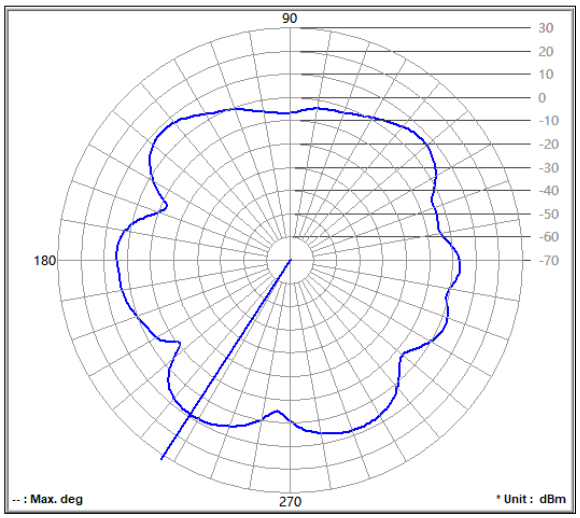
Brand / Model : YR0076
Remark : EUT X-Z, 2403MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen

Location: **RF Chamber 1** Date: **2024/3/13** Time: **下午 02:05:10**

Temperature (℃): **21** Humidity (%): **58** Approved by:



Frequency (MHz) : **2403.00** Antenna Polarity : **Horizontal** Average Value (dBm) : **3.26**

Maximum Value (dBm) : **8.94** Maximum Value (degree) : **237**

Minimum Value (dBm) : **-12.41** Minimum Value (degree) : **157**

V 6.2

D:\Antenna Pattern V6.3\Graph\0313\03130008.png

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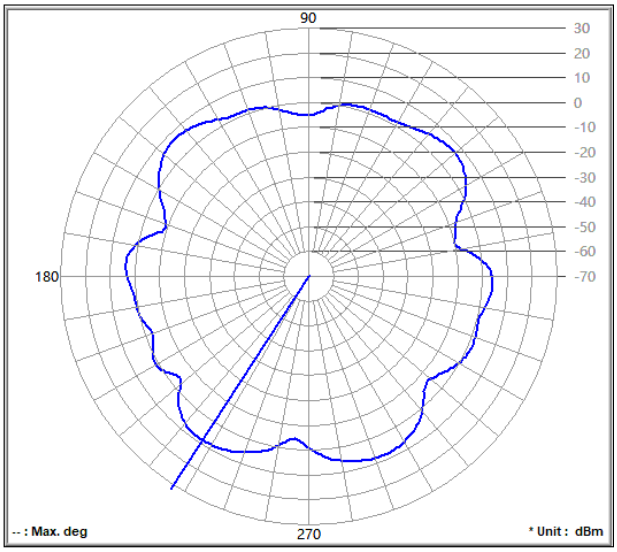
Brand / Model : YR0076
Remark : EUT X-Z, 2442MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen

Location: **RF Chamber 1** Date: **2024/3/13** Time: **下午 02:12:27**

Temperature (℃): **21** Humidity (%): **58** Approved by:



Frequency (MHz) : **2442.00** Antenna Polarity : **Horizontal** Average Value (dBm) : **3.18**

Maximum Value (dBm) : **8.49** Maximum Value (degree) : **237**

Minimum Value (dBm) : **-9.55** Minimum Value (degree) : **13**

V 6.2

D:\Antenna Pattern V6.3\Graph\0313\03130009.png

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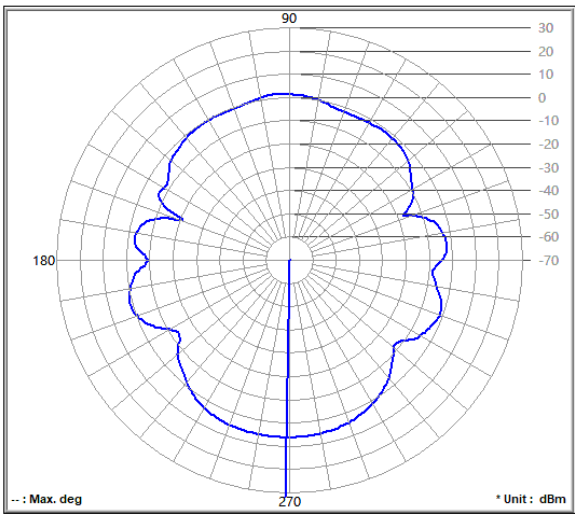
Brand / Model : YR0076
Remark : EUT X-Z, 2442MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen

Location: **RF Chamber 1** Date: **2024/3/13** Time: **下午 02:15:42**

Temperature (℃): **21** Humidity (%): **58** Approved by:



Frequency (MHz) : **2442.00** Antenna Polarity : **Vertical** Average Value (dBm) : **0.10**

Maximum Value (dBm) : **6.28** Maximum Value (degree) : **269**

Minimum Value (dBm) : **-20.95** Minimum Value (degree) : **159**

V 6.2

D:\Antenna Pattern V6.3\Graph\0313\03130010.png

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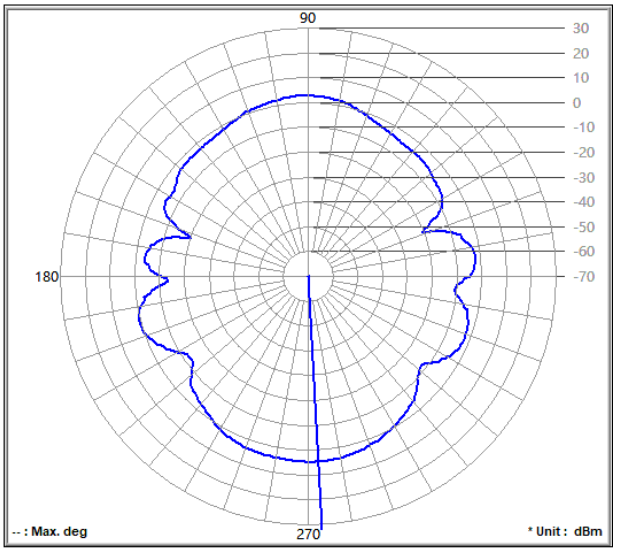
Brand / Model : YR0076
Remark : EUT X-Z, 2479MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen

Location: RF Chamber 1 Date: 2024/3/13 Time: 下午 02:20:55
Temperature (℃): 21 Humidity (%): 58 Approved by:



Frequency (MHz) : 2479.00 Antenna Polarity : Vertical Average Value (dBm) : -0.83
Maximum Value (dBm) : 4.82 Maximum Value (degree) : 273
Minimum Value (dBm) : -20.70 Minimum Value (degree) : 21
V 6.2

D:\Antenna Pattern V6.3\Graph\0313\03130011.png

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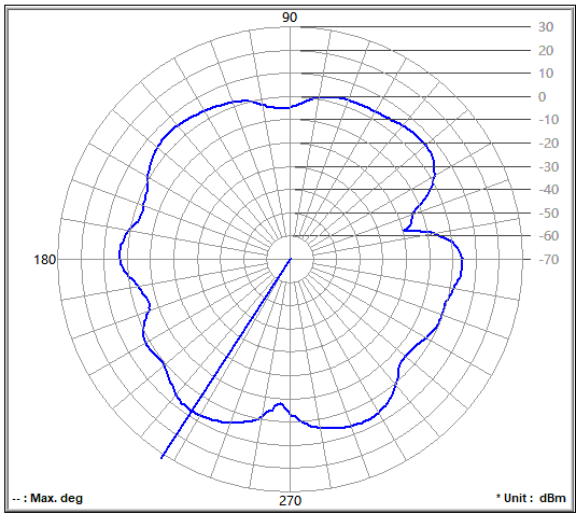
Brand / Model : YR0076
Remark : EUT X-Z, 2479MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen

Location: RF Chamber 1 Date: 2024/3/13 Time: 下午 02:24:30
Temperature (℃): 21 Humidity (%): 58 Approved by:



Frequency (MHz) : 2479.00 Antenna Polarity : Horizontal Average Value (dBm) : 2.57
Maximum Value (dBm) : 7.71 Maximum Value (degree) : 237
Minimum Value (dBm) : -19.93 Minimum Value (degree) : 14
V 6.2

D:\Antenna Pattern V6.3\Graph\0313\03130012.png

Y-Z Plane

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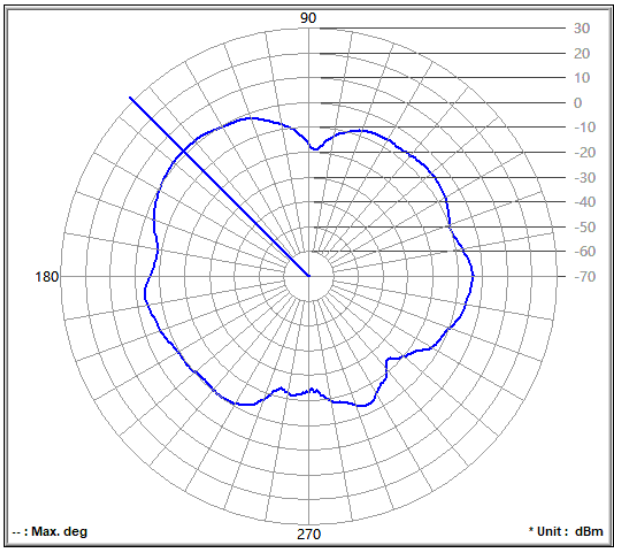
Brand / Model : YR0076
Remark : EUT Y-Z, 2403MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen

Location: **RF Chamber 1** Date: **2024/3/13** Time: **下午 02:40:45**

Temperature (℃): **21** Humidity (%): **58** Approved by:



Frequency (MHz) : **2403.00** Antenna Polarity : **Horizontal** Average Value (dBm) : **-5.77**

Maximum Value (dBm) : **1.62** Maximum Value (degree) : **135**

Minimum Value (dBm) : **-24.47** Minimum Value (degree) : **271**

V 6.2

D:\Antenna Pattern V6.3\Graph\0313\03130013.png

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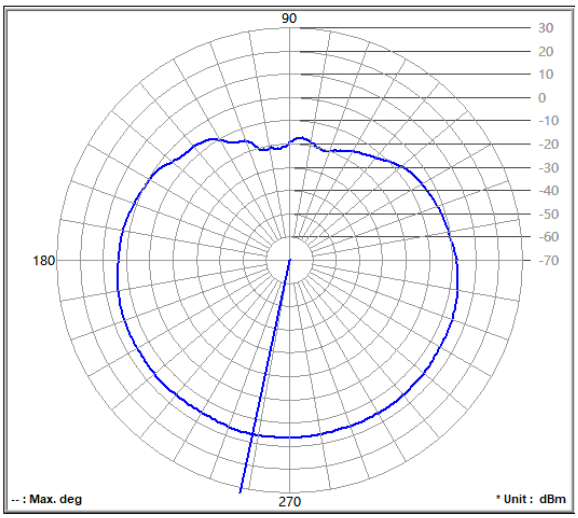
Brand / Model : YR0076
Remark : EUT Y-Z, 2403MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen

Location: **RF Chamber 1** Date: **2024/3/13** Time: **下午 02:44:10**

Temperature (℃): **21** Humidity (%): **58** Approved by:



Frequency (MHz) : **2403.00** Antenna Polarity : **Vertical** Average Value (dBm) : **2.95**

Maximum Value (dBm) : **6.51** Maximum Value (degree) : **258**

Minimum Value (dBm) : **-22.32** Minimum Value (degree) : **95**

V 6.2

D:\Antenna Pattern V6.3\Graph\0313\03130014.png

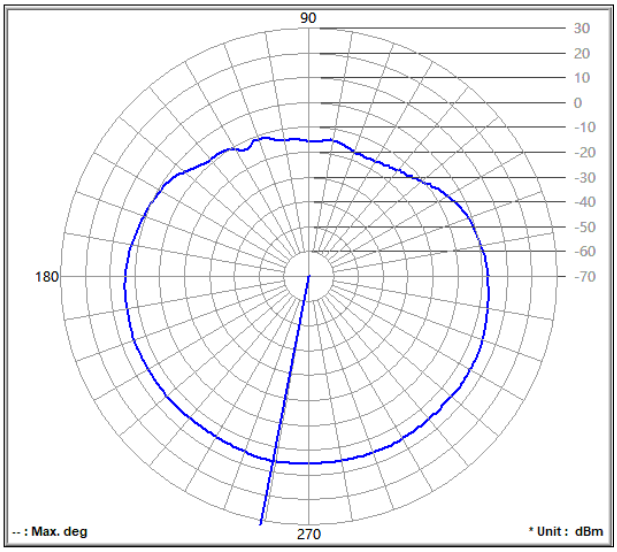
香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

www.adt.com.tw Hwa Ya Lab & Head Office, Tel +886-3-3183232 / Linkou EMC/RF Lab, Tel +886-2-26052180 / Hsinchu EMC/RF Lab, Tel +886-3-5935343

Brand / Model : YR0076
Remark : EUT Y-Z, 2442MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen

Location: **RF Chamber 1** Date: **2024/3/13** Time: **下午 02:52:03**

Temperature (℃): **21** Humidity (%): **58** Approved by:



Frequency (MHz) : **2442.00** Antenna Polarity : **Vertical** Average Value (dBm) : **2.47**

Maximum Value (dBm) : **5.77** Maximum Value (degree) : **259**

Minimum Value (dBm) : **-16.93** Minimum Value (degree) : **63**

V 6.2

D:\Antenna Pattern V6.3\Graph\0313\03130015.png

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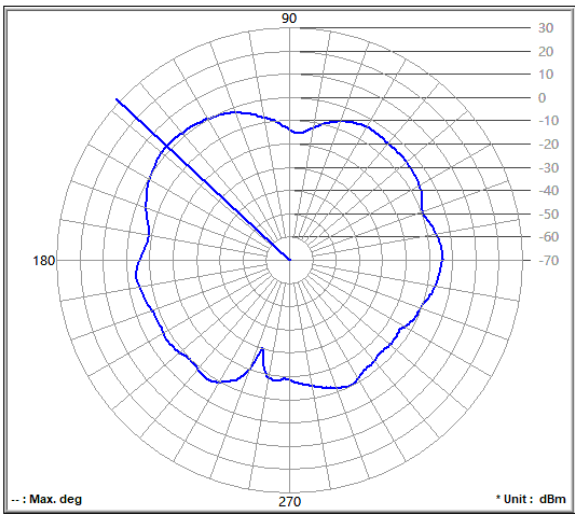
Brand / Model : YR0076
Remark : EUT Y-Z, 2442MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen

Location: **RF Chamber 1** Date: **2024/3/13** Time: **下午 02:57:01**

Temperature (℃): **21** Humidity (%): **58** Approved by:



Frequency (MHz) : **2442.00** Antenna Polarity : **Horizontal** Average Value (dBm) : **-5.26**

Maximum Value (dBm) : **2.20** Maximum Value (degree) : **137**

Minimum Value (dBm) : **-30.95** Minimum Value (degree) : **253**

V 6.2

D:\Antenna Pattern V6.3\Graph\0313\03130016.png

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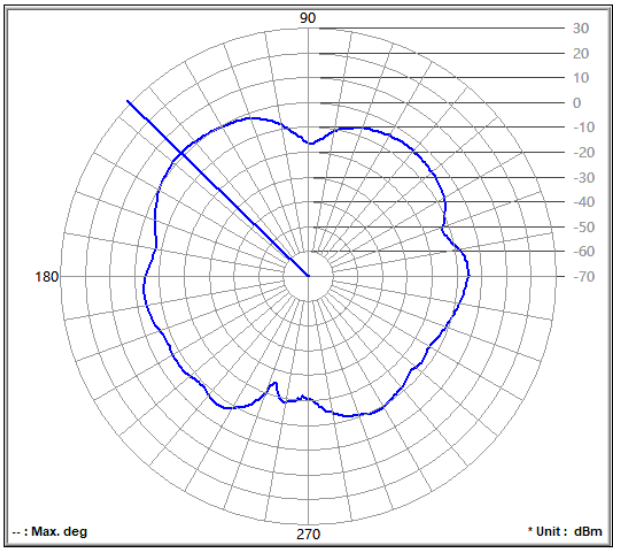
Brand / Model : YR0076
Remark : EUT Y-Z, 2479MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen

Location: **RF Chamber 1** Date: **2024/3/13** Time: **下午 03:02:21**

Temperature (℃): **21** Humidity (%): **58** Approved by:



Frequency (MHz) : **2479.00** Antenna Polarity : **Horizontal** Average Value (dBm) : **-5.50**

Maximum Value (dBm) : **1.52** Maximum Value (degree) : **136**

Minimum Value (dBm) : **-25.27** Minimum Value (degree) : **253**

V 6.2

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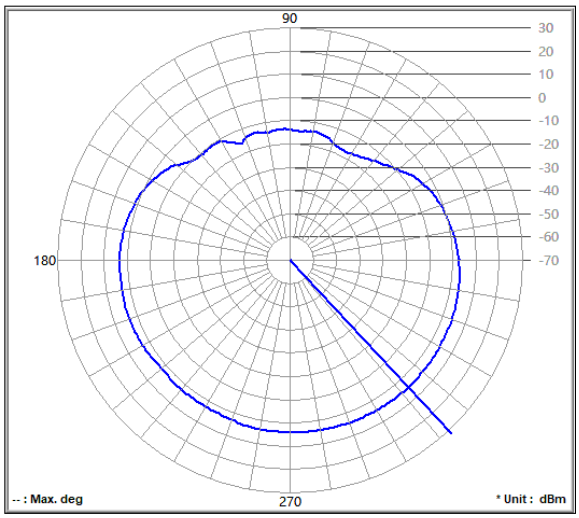
Brand / Model : YR0076
Remark : EUT Y-Z, 2479MHz, Battery, Conducted =0
Sample No. WTW240308/014Q04N01
Tested by : Tobey Chen

Location: **RF Chamber 1** Date: **2024/3/13** Time: **下午 03:06:27**

Temperature (℃): **21** Humidity (%): **58** Approved by:



Frequency (MHz) : **2479.00** Antenna Polarity : **Vertical** Average Value (dBm) : **1.53**

Maximum Value (dBm) : **4.61** Maximum Value (degree) : **313**

Minimum Value (dBm) : **-17.76** Minimum Value (degree) : **61**

V 6.2

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