

Logitech

Antenna Under Test (AUT)

Report

Model Name: YR0100

Equipment Type: Wireless Keyboard

Manufacturer: Logitech Far East LTD.

Test Location: #2, Creation Rd. 4, Science-based Ind. Park Hsinchu
Taiwan, R.O.C

Tested personnel: _Louis Teng_____

Report Date: _24-Jan 2024_____

Report Release History

Report version	Description	Date Issued
YR0100 AUT Report	Original release	2024/1/24

Table of Contents

1. EUT Antenna Information	3
2. Measured Values and Calculation of Antenna Gains	3
3. Conducted Power Measurement	4
3.1 Test Setup	4
3.2 Test Instruments	4
3.3 Test Procedure	4
3.4 Test Result of RF conducted Power	5
4. 2D Radiation Pattern Measurement	6
4.1 Test Location	6
4.2 Description of the anechoic chamber	6
4.3 Test Instruments	6
4.4 Test Procedure	7
4.5 Test Setup photos	8
4.6 2D Pattern Test Plot	8
5. Appendix for Logi internal reference	21

1. EUT Antenna Information

- 1) Antenna Material : ceramic
- 2) Antenna Type : ceramic chip antenna
- 3) Antenna Dimension: 20 x 10 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.

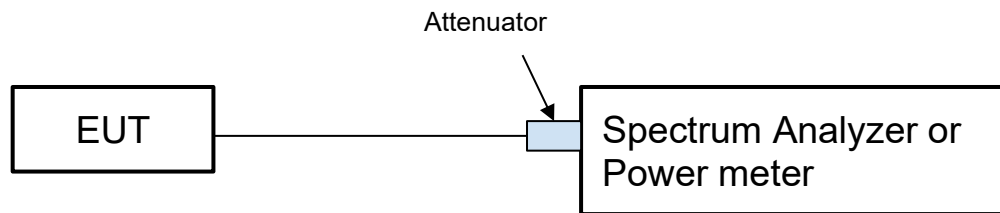
$$\text{Antenna Peak Gain (dBi)} = \text{Max EIRP(dBm)} - \text{Conducted Power (dBm)}$$

Frequency	X-Y Plane $\phi=0\sim360^\circ, \theta=90^\circ$		Y-Z Plane $\phi=0^\circ, \theta=0\sim360^\circ$		X-Z Plane $\phi=90^\circ, \theta=0\sim360^\circ$		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)			
2402	-7.46	6.52	-2.36	6.24	4.71	6.76	6.76	4.52	2.24
2440	-8.76	7.22	-0.83	6.29	5.71	7.56	7.56	4.47	3.09
2480	-7.84	6.65	-2.53	6.28	5.7	6.43	6.65	4.35	2.3

Test Date: 09-Jan 2024

3. Conducted Power Measurement

3.1 Test Setup



3.2 Test Instruments

Description	Model No.	Serial No.	Calibration date	calibration until
Power Meter Anritsu	ML2495A	1529002	2023/6/17	2024/6/16
Pulse Power Sensor Anritsu	MA2411B	1339443	2023/5/8	2024/5/7
Spectrum Analyzer Keysight	N9030A	MY54490520	2023/2/3	2024/2/2

Note: The calibration interval of the above test instruments is _12___ 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	Conducted Power (dBm)
2402	4.52

Frequency	Conducted Power (dBm)
2440	4.47
2480	4.35

Test Date: 19-Jan 2024

4. 2D Radiation Pattern Measurement

4.1 Test Location

TW BV ADT. 2D radiation pattern measurement in the anechoic chamber

4.2 Description of the anechoic chamber

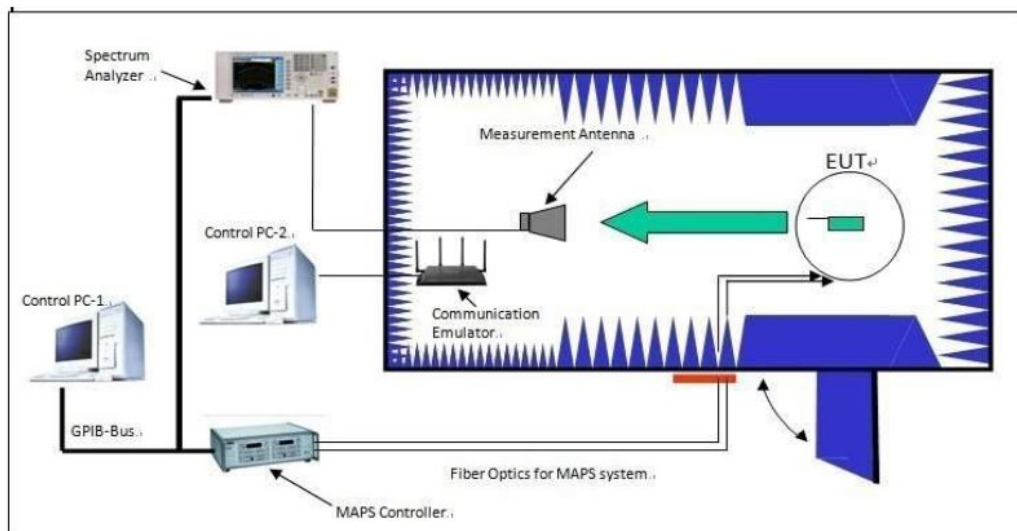
Length: 10m

Width: 5m

Height: 5m

Turntable height: 1.5m

Measurement antenna height: 1.5m



4.3 Test Instruments

Description	Model No.	Serial No.	Last Calibration	
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Spectrum Analyzer Keysight	N9030A	MY54490520	2023/2/3	2024/2/2
Horn Antenna ETS	BBHA 9120 D	9120D-1479	2023/11/12	2024/11/11
Software	Antenna Pattern V6.2-210118	N/A	N/A	N/A
Antenna Tower/ Turntable	MF-7802	MF780208542	N/A	NA
PSG analog signal generator (from 250 kHz to 50 GHz) Keysight	E8257D	MY53401987	2023/6/14	2024/6/13
RF Coaxial Cable	SUCOFLEX104	RF104-215	2023/6/2	2024/6/1

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

4.4 Test Procedure

- i. Connect the EUT to Spectrum Analyzer 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 power(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 channel 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 15-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. According to substitution techniques, a substitution horn antenna is substituted for EUT at the same position and the signal generator exports the CW signal to the substitution antenna via a TX cable. Rotated the turntable and moved the 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" gotten from step vii. Record the power level of S.G.

$$\text{EIRP} = P_{\text{SigGen}} + G_T - L_C$$

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)

4.6 2D Pattern Test Plot

X-Y Plane: Horizontal and Vertical

	<u>Hor</u>	<u>Ver</u>
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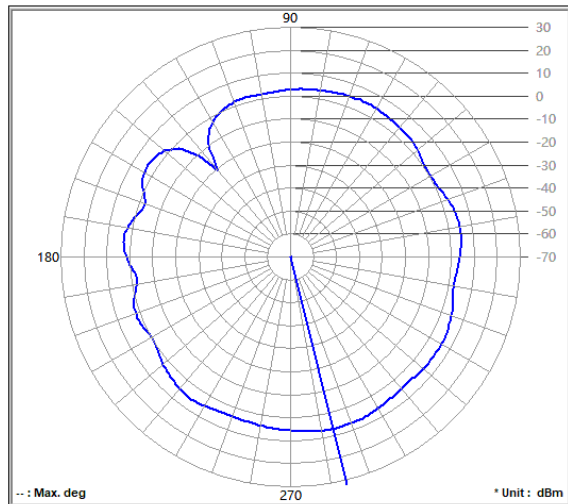
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Brand / Model : YR0100 (Sample2)
Remark : EUT X-Y ,BLE 1M 2440MHz,Setting=Default,Conducted Power =0 ,Battery mode
Sample No. : WTW240103/014Q06N03
Tested by : HarryChung

Location: RF Chamber 1 Date: 2024/1/6 Time: 下午 06:34:34
Temperature (°C): 22 Humidity (%): 62 Approved by:



Frequency (MHz): 2440.00 Antenna Polarity: Horizontal Average Value (dBm): 3.60
Maximum Value (dBm): 7.22 Maximum Value (degree): 284
Minimum Value (dBm): -21.17 Minimum Value (degree): 130

V 6.2

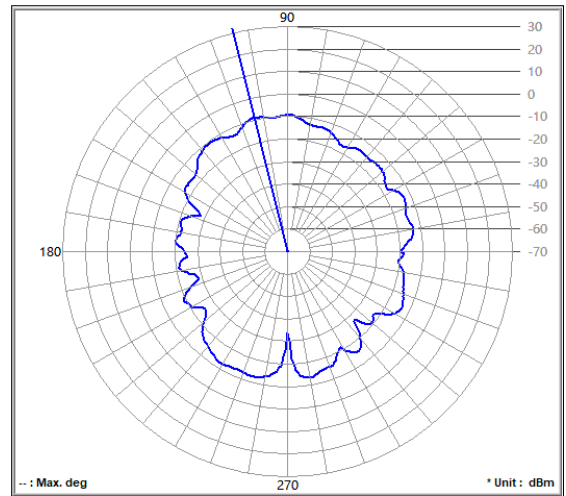
D:\Antenna Pattern V6.3\Graph\0106\01060002.png



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Brand / Model : YR0100 (Sample2)
Remark : EUT X-Y ,BLE 1M 2440MHz,Setting=Default,Conducted Power =0 ,Battery mode
Sample No. : WTW240103/014Q06N03
Tested by : HarryChung

Location: RF Chamber 1 Date: 2024/1/6 Time: 下午 06:32:01
Temperature (°C): 22 Humidity (%): 62 Approved by:



Frequency (MHz): 2440.00 Antenna Polarity: Vertical Average Value (dBm): -14.72
Maximum Value (dBm): -8.76 Maximum Value (degree): 104
Minimum Value (dBm): -33.76 Minimum Value (degree): 270

V 6.2

D:\Antenna Pattern V6.3\Graph\0106\01060001.png

H



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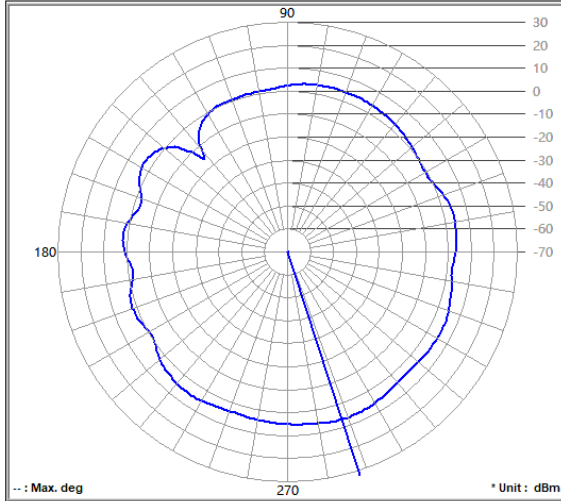
Brand / Model : YR0100 (Sample2)

Remark : EUT X-Y ,BLE 1M 2480MHz,Setting=Default,Conducted Power =0 ,Battery mode

Sample No. : WTW240103/014Q06N03

Tested by : HarryChung

Location: RF Chamber 1 Date: 2024/1/6 Time: 下午 06:49:24
Temperature (°C): 22 Humidity (%): 62 Approved by:



Frequency (MHz): 2480.00 Antenna Polarity: Horizontal Average Value (dBm): 3.13
Maximum Value (dBm): 6.65 Maximum Value (degree): 288
Minimum Value (dBm): -15.85 Minimum Value (degree): 132
V 6.2
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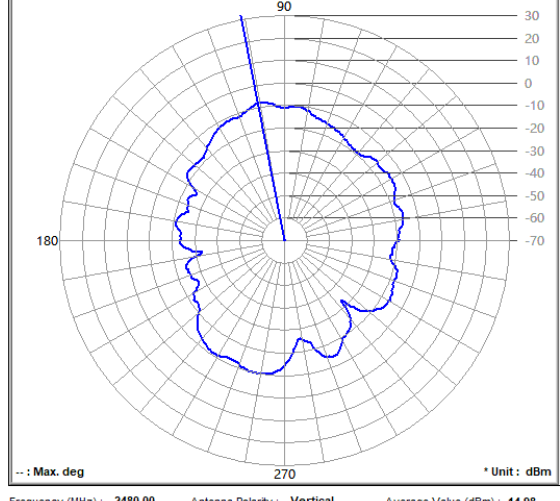
Brand / Model : YR0100 (Sample2)

Remark : EUT X-Y ,BLE 1M 2480MHz,Setting=Default,Conducted Power =0 ,Battery mode

Sample No. : WTW240103/014Q06N03

Tested by : HarryChung

Location: RF Chamber 1 Date: 2024/1/6 Time: 下午 06:51:42
Temperature (°C): 22 Humidity (%): 62 Approved by:



Frequency (MHz): 2480.00 Antenna Polarity: Vertical Average Value (dBm): -14.98
Maximum Value (dBm): -7.84 Maximum Value (degree): 101
Minimum Value (dBm): -33.22 Minimum Value (degree): 314
V 6.2
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X-Z Plane: Horizontal and Vertical

Hor

Ver

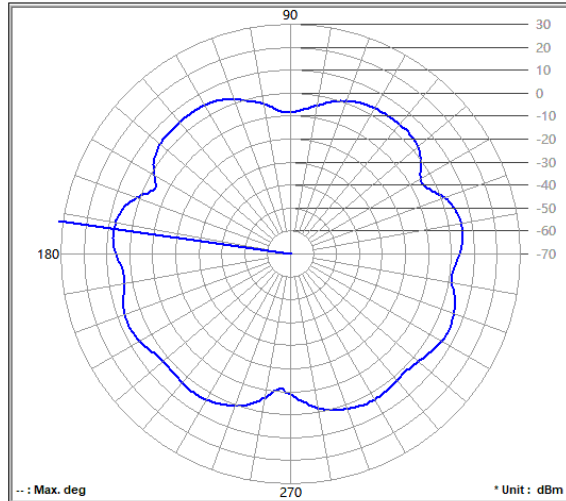
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Brand / Model : YR0100 (Sample2)
Remark : EUT X-Z, BLE 1M 2440MHz, Setting=Default, Conducted Power =0, Battery mode
Sample No. : WTW240103/014Q06N03
Tested by : HarryChung

Location: RF Chamber 1 Date: 2024/1/6 Time: 下午 06:37:33
Temperature (°C): 22 Humidity (%): 62 Approved by:



Frequency (MHz): 2440.00 Antenna Polarity: Horizontal Average Value (dBm): 3.04
Maximum Value (dBm): 7.56 Maximum Value (degree): 172
Minimum Value (dBm): -11.04 Minimum Value (degree): 266

V 6.2

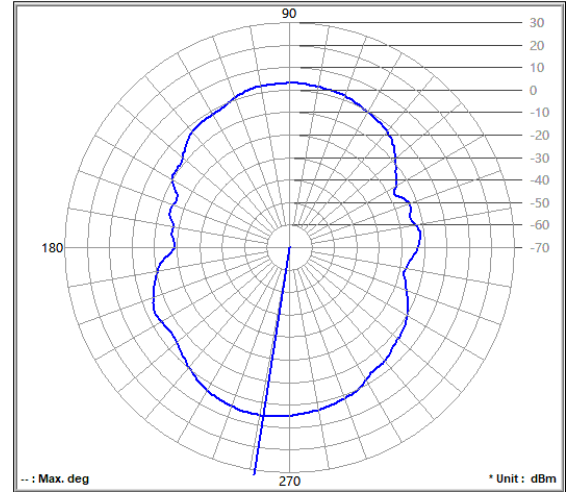
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Brand / Model : YR0100 (Sample2)
Remark : EUT X-Z, BLE 1M 2440MHz, Setting=Default, Conducted Power =0, Battery mode
Sample No. : WTW240103/014Q06N03
Tested by : HarryChung

Location: RF Chamber 1 Date: 2024/1/6 Time: 下午 06:39:53
Temperature (°C): 22 Humidity (%): 62 Approved by:

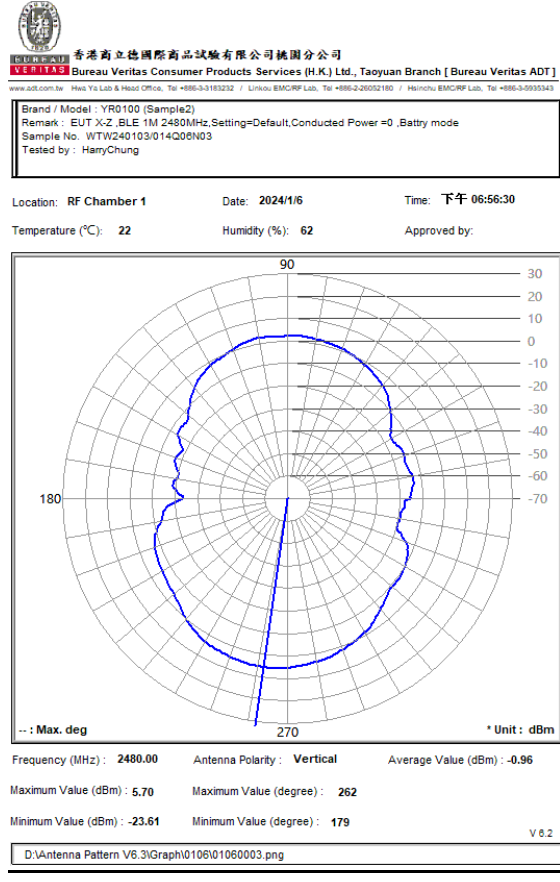
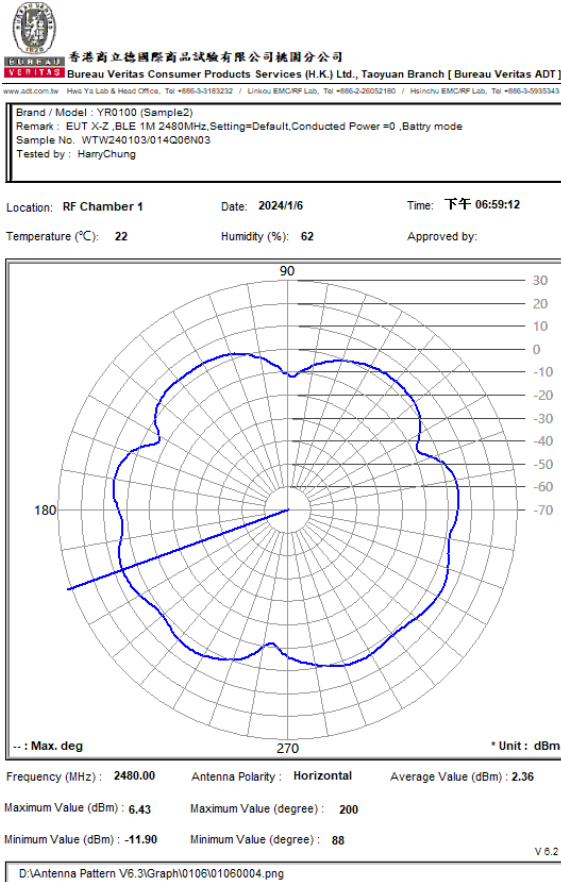


Frequency (MHz): 2440.00 Antenna Polarity: Vertical Average Value (dBm): -0.70
Maximum Value (dBm): 5.71 Maximum Value (degree): 261
Minimum Value (dBm): -19.28 Minimum Value (degree): 179

V 6.2

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H



Y-Z Plane: Horizontal and Vertical

Hor

Ver

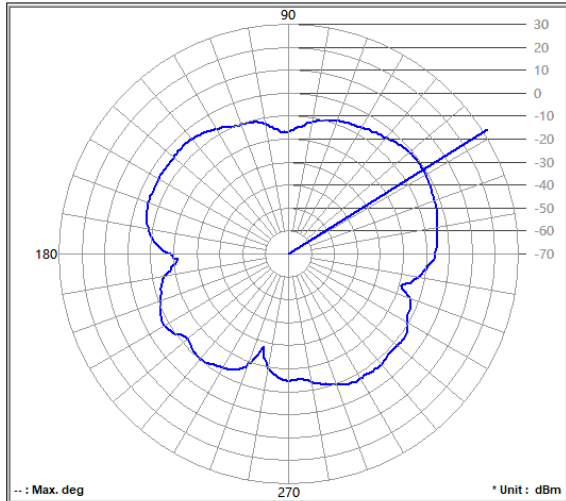
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Brand / Model : YR0100 (Sample2)
Remark : EUT Y-Z, BLE 1M 2440MHz, Setting=Default, Conducted Power =0, Battery mode
Sample No. : WTW240103/014Q06N03
Tested by : HarryChung

Location: RF Chamber 1 Date: 2024/1/6 Time: 下午 06:45:24
Temperature (°C): 22 Humidity (%): 62 Approved by:



Frequency (MHz): 2440.00 Antenna Polarity: Horizontal Average Value (dBm): -7.19
Maximum Value (dBm): -0.83 Maximum Value (degree): 32
Minimum Value (dBm): -28.29 Minimum Value (degree): 255

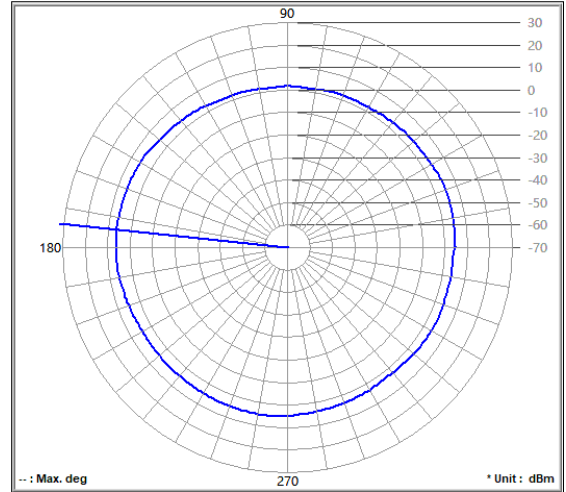
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Brand / Model : YR0100 (Sample2)
Remark : EUT Y-Z, BLE 1M 2440MHz, Setting=Default, Conducted Power =0, Battery mode
Sample No. : WTW240103/014Q06N03
Tested by : HarryChung

Location: RF Chamber 1 Date: 2024/1/6 Time: 下午 06:43:14
Temperature (°C): 22 Humidity (%): 62 Approved by:



Frequency (MHz): 2440.00 Antenna Polarity: Vertical Average Value (dBm): 4.12
Maximum Value (dBm): 6.29 Maximum Value (degree): 174
Minimum Value (dBm): 1.24 Minimum Value (degree): 98

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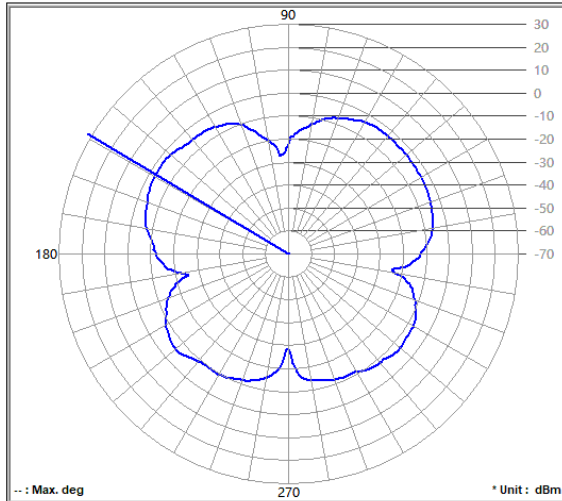
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Brand / Model : YR0100 (Sample2)
Remark : EUT Y-Z, BLE 1M 2480MHz, Setting=Default, Conducted Power =0, Battery mode
Sample No. : WTW240103/014Q06N03
Tested by : HarryChung

Location: RF Chamber 1 Date: 2024/1/6 Time: 下午 07:03:30
Temperature (°C): 22 Humidity (%): 62 Approved by:



Frequency (MHz): 2480.00 Antenna Polarity: Horizontal Average Value (dBm): -7.29
Maximum Value (dBm): -2.53 Maximum Value (degree): 149
Minimum Value (dBm): -28.95 Minimum Value (degree): 270

V 6.2

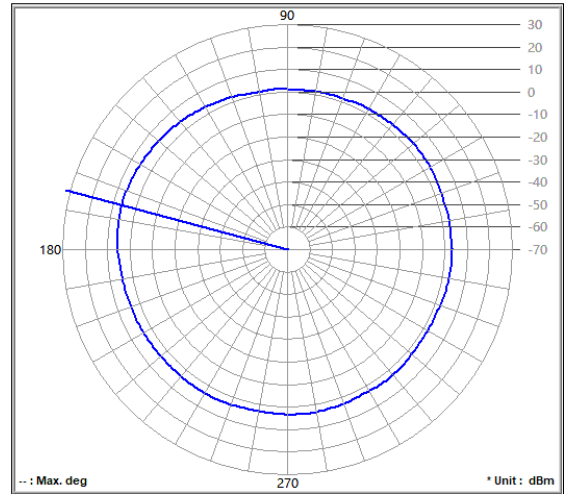
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Brand / Model : YR0100 (Sample2)
Remark : EUT Y-Z, BLE 1M 2480MHz, Setting=Default, Conducted Power =0, Battery mode
Sample No. : WTW240103/014Q06N03
Tested by : HarryChung

Location: RF Chamber 1 Date: 2024/1/6 Time: 下午 07:06:26
Temperature (°C): 22 Humidity (%): 62 Approved by:



Frequency (MHz): 2480.00 Antenna Polarity: Vertical Average Value (dBm): 3.44
Maximum Value (dBm): 6.28 Maximum Value (degree): 165
Minimum Value (dBm): 0.99 Minimum Value (degree): 87

V 6.2

D:\Antenna Pattern V6.3\Graph\0106\01060006.png