

Logitech

Antenna Under Test (AUT)

Report

Model Name: YR0109

Equipment Type: Wireless Keyboard

Manufacturer: Logitech Far East LTD.

Antenna Model Name: RFECA3216060A1T

Antenna Manufacturer: Walsin

Test Location: Logitech Technology (Suzhou) Co., Ltd at No.3 Song Shan Road, New district, Suzhou City, China 215129 and BV Hsinchu at E-2, No. 1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan

Tested by: Shixue Yi and Vanness Huang

Report Date: 2025.1.7

Report Release History

Report version	Description	Date Issued
YR0109 AUT Report	Original release	2025/1/7

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1. EUT Antenna Information

- 1) Antenna Material : Ceramic
- 2) Antenna Type : Ceramic chip antenna
- 3) Antenna Dimension: 3.1x1.6
- 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.

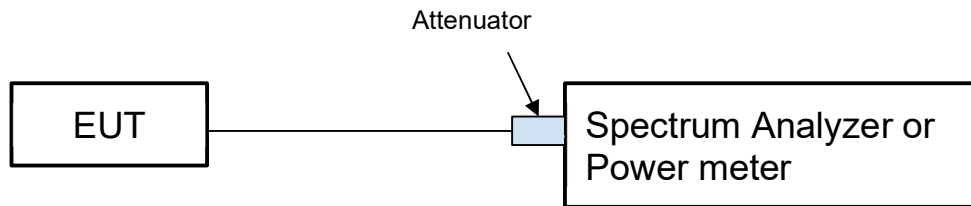
$$\text{Antenna Peak Gain (dBi)} = \text{Max EIRP(dBm)} - \text{Conducted Power (dBm)}$$

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	-8.77	5.8	4.03	-4.29	2.61	6.38	6.38	3.491	2.89
2440	-7.86	6.06	4.57	-4.46	3.85	6.3	6.3	3.628	2.67
2480	-8.39	5.43	4.23	-4.66	3.17	5.63	5.63	3.568	2.06

Test Date: 7-Jan 2025

3. Conducted Power Measurement

3.1 Test Setup



3.2 Test Instruments

Description	Model No.	Serial No.	Last Calibration
Spectrum Analyzer Keysight	N9030A	MY54490520	2024/8/7
RF signal cable	Huber+suhner	2131206	2024/6/18

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	3.491
2440	3.628
2480	3.568

Test Date: 7-Jan 2025

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

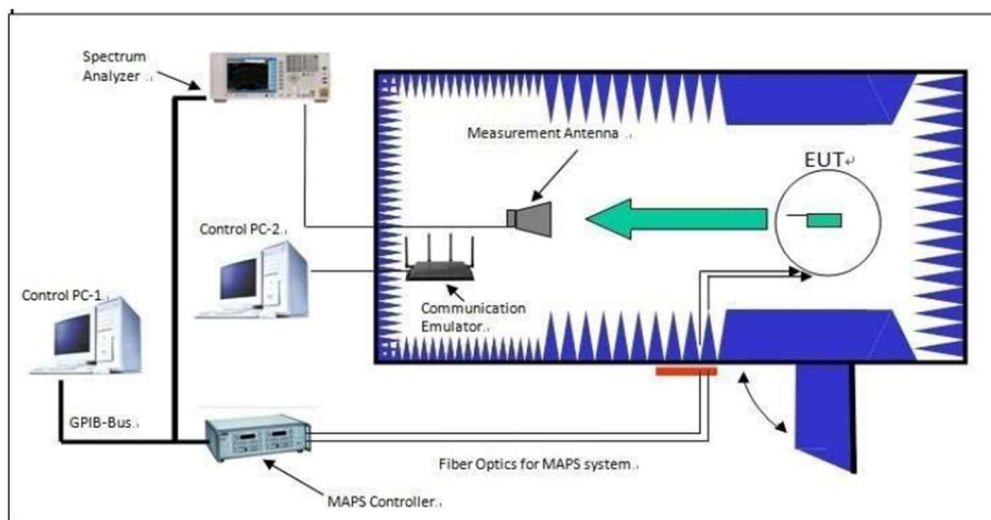
Length: 10m

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	2024/8/7	2025/8/6
Horn Antenna ETS	BBHA 9120 D	9120D-1479	2024/11/10	2025/11/9
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	2024/6/12	2025/6/11
RF Coaxial Cable	EMC102-KM-KM-8000	160201R	2024/5/29	2025/5/28

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;

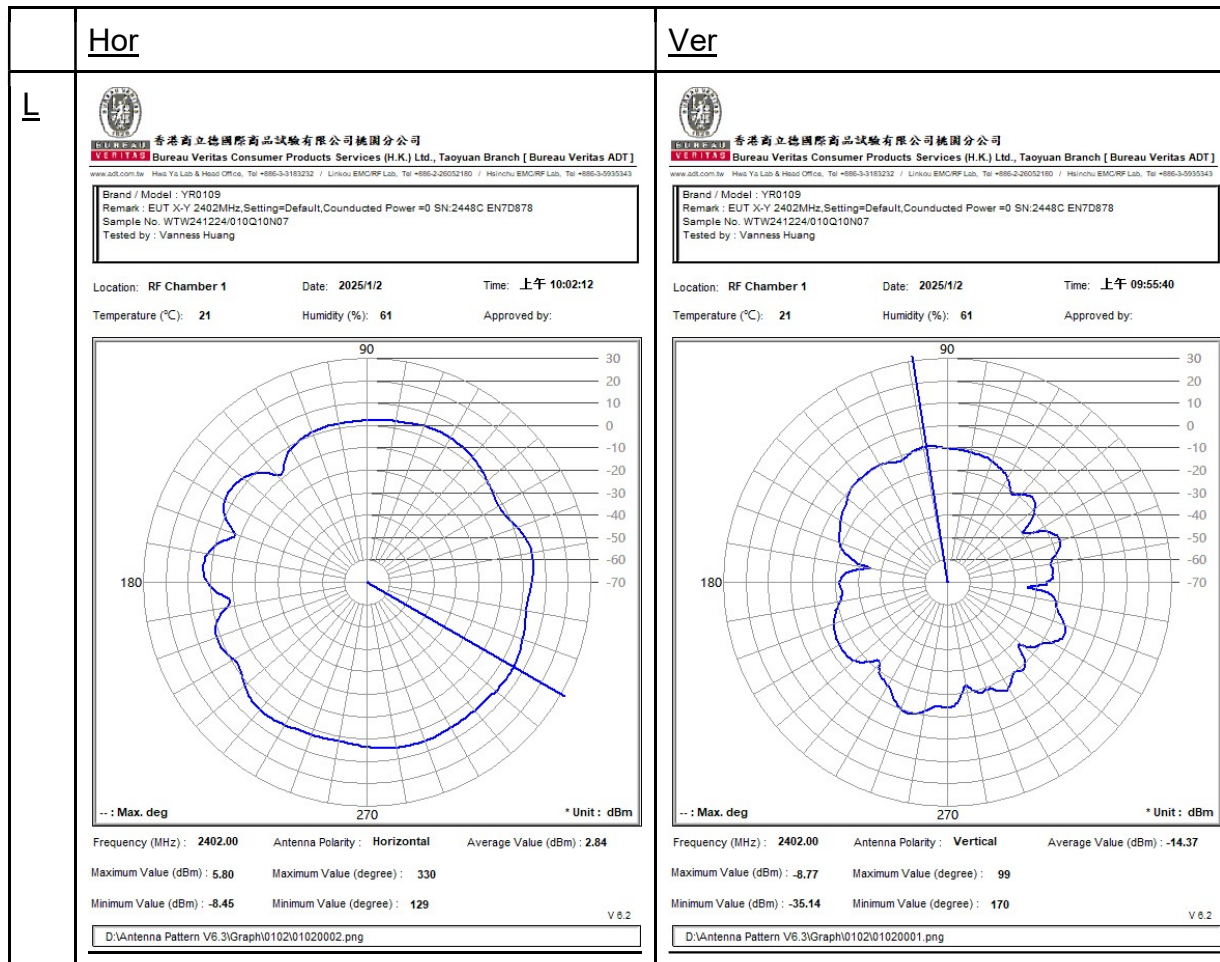
G_T = gain of the substitute antenna, in dBd (ERP) or dBi (EIRP);

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



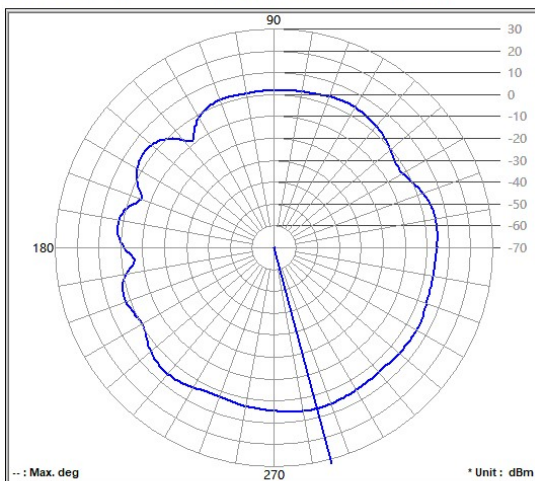
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Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]
www.bv.com.tw Hsin Yi Lab & Head Office, Tel: +886-3-3163232 / URM/UL EMC/RF Lab, Tel: +886-3-20032180 / Hsinchu EMC/RF Lab, Tel: +886-3-5935343

Brand / Model : YR0109
Remark : EUT X-Y 2440MHz Setting=Default, Couducted Power =0 SN:2448C EN7D878
Sample No. WTW241224/010Q10N07
Tested by : Vanness Huang

Location: RF Chamber 1 Date: 2025/1/2 Time: 上午 10:19:56
Temperature (°C): 21 Humidity (%): 61 Approved by:



Frequency (MHz): 2440.00 Antenna Polarity: Horizontal Average Value (dBm): 3.06
Maximum Value (dBm): 6.06 Maximum Value (degree): 285
Minimum Value (dBm): -8.52 Minimum Value (degree): 128

V 8.2

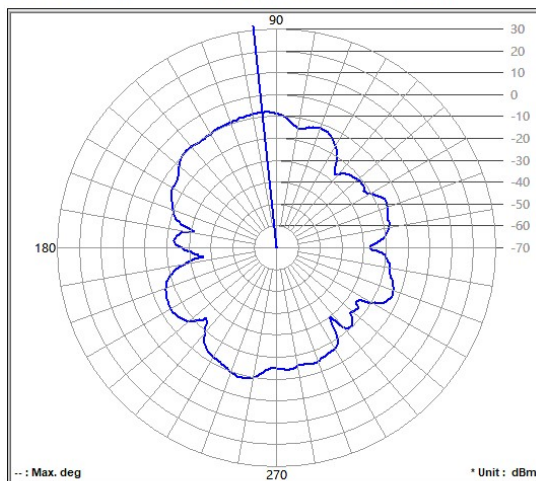
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Brand / Model : YR0109
Remark : EUT X-Y 2440MHz Setting=Default, Couducted Power =0 SN:2448C EN7D878
Sample No. WTW241224/010Q10N07
Tested by : Vanness Huang

Location: RF Chamber 1 Date: 2025/1/2 Time: 上午 10:23:05
Temperature (°C): 21 Humidity (%): 61 Approved by:



Frequency (MHz): 2440.00 Antenna Polarity: Vertical Average Value (dBm): -13.85
Maximum Value (dBm): -7.86 Maximum Value (degree): 96
Minimum Value (dBm): -36.44 Minimum Value (degree): 187

V 8.2

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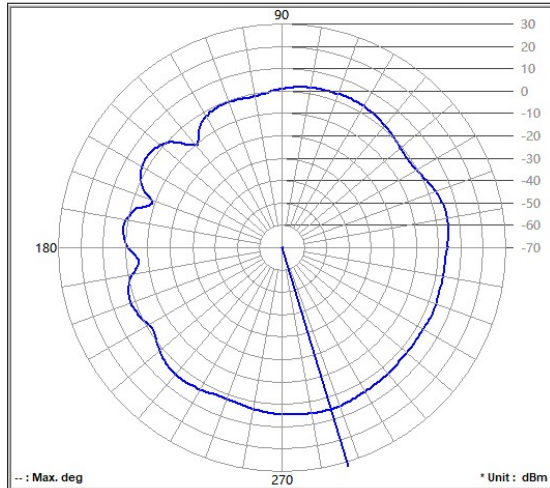
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Brand / Model : YR0109
Remark : EUT X-Y 2480MHz,Setting=Default,Conducted Power =0 SN:2448C ENT0878
Sample No. WTW241224/010Q10N07
Tested by : Vanness Huang

Location: RF Chamber 1 Date: 2025/1/2 Time: 上午 10:32:26
Temperature (°C): 21 Humidity (%): 61 Approved by:



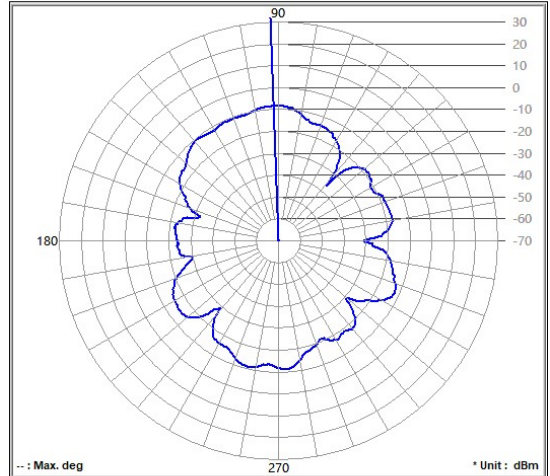
Frequency (MHz): 2480.00 Antenna Polarity: Horizontal Average Value (dBm): 2.25
Maximum Value (dBm): 5.43 Maximum Value (degree): 287
Minimum Value (dBm): -10.17 Minimum Value (degree): 130
V 6.2
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Brand / Model : YR0109
Remark : EUT X-Y 2480MHz,Setting=Default,Conducted Power =0 SN:2448C ENT0878
Sample No. WTW241224/010Q10N07
Tested by : Vanness Huang

Location: RF Chamber 1 Date: 2025/1/2 Time: 上午 10:29:12
Temperature (°C): 21 Humidity (%): 61 Approved by:

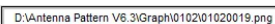


Frequency (MHz): 2480.00 Antenna Polarity: Vertical Average Value (dBm): -14.75
Maximum Value (dBm): -8.39 Maximum Value (degree): 92
Minimum Value (dBm): -36.82 Minimum Value (degree): 49
V 6.2
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X-Z Plane: Horizontal and Vertical

Hor

Ver



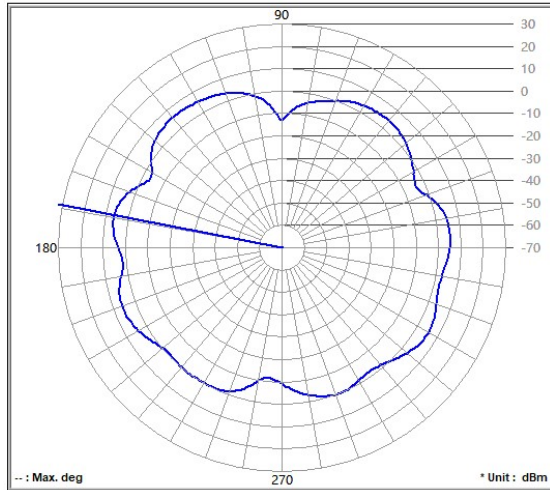
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Brand / Model : YR0109
Remark : EUT X-Z 2440MHz,Setting=Default,Conducted Power =0 SN:2448C EN7D878
Sample No. WTW241224/010Q10N07
Tested by : Vanness Huang

Location: RF Chamber 1 Date: 2025/1/2 Time: 下午 01:07:30
Temperature (°C): 21 Humidity (%): 61 Approved by:



Frequency (MHz): 2440.00 Antenna Polarity: Horizontal Average Value (dBm): 2.35
Maximum Value (dBm): 6.30 Maximum Value (degree): 169
Minimum Value (dBm): -12.95 Minimum Value (degree): 90

V 6.2

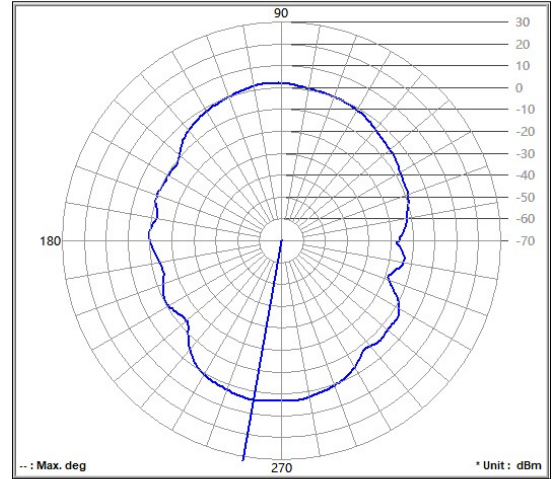
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Brand / Model : YR0109
Remark : EUT X-Z 2440MHz,Setting=Default,Conducted Power =0 SN:2448C EN7D878
Sample No. WTW241224/010Q10N07
Tested by : Vanness Huang

Location: RF Chamber 1 Date: 2025/1/2 Time: 下午 01:05:06
Temperature (°C): 21 Humidity (%): 61 Approved by:

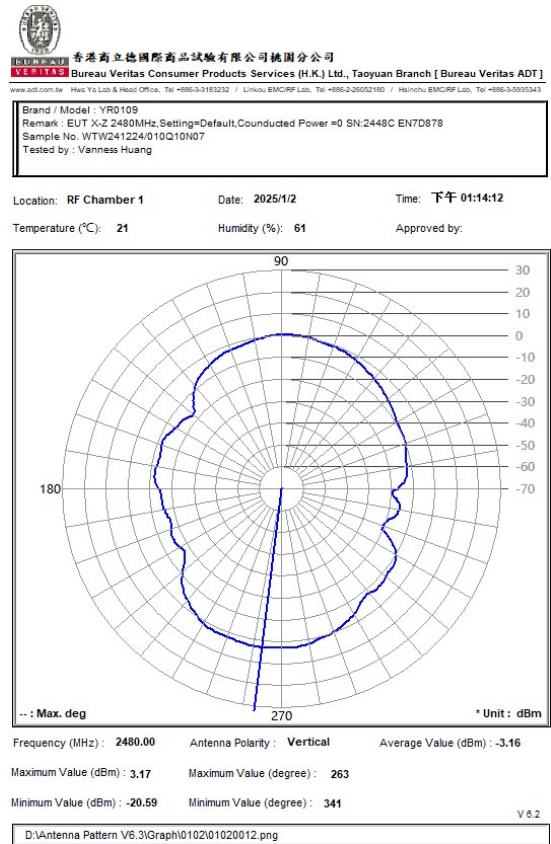
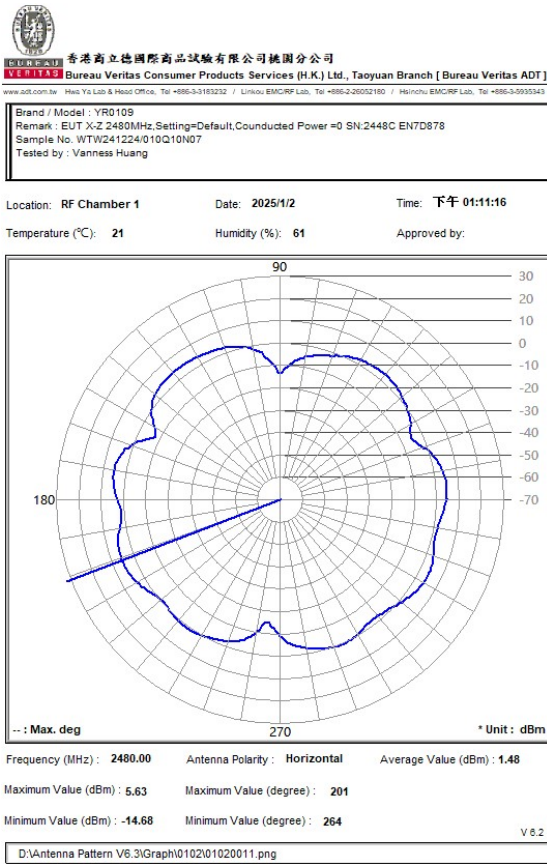


Frequency (MHz): 2440.00 Antenna Polarity: Vertical Average Value (dBm): -2.18
Maximum Value (dBm): 3.85 Maximum Value (degree): 260
Minimum Value (dBm): -18.50 Minimum Value (degree): 342

V 6.2

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H



Y-Z Plane: Horizontal and Vertical

Hor

Ver



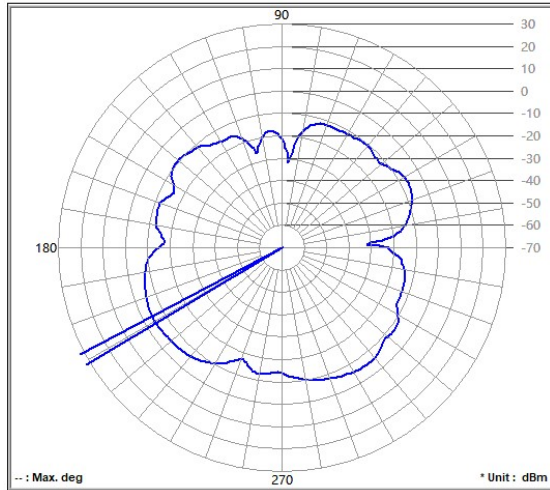
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Brand / Model : YR0109
Remark : EUT Y-Z 2440MHz,Setting=Default,Conducted Power =0 SN:2448C EN7D878
Sample No. WTW241224/010Q10N07
Tested by : Vanness Huang

Location: RF Chamber 1 Date: 2025/1/2 Time: 下午 01:37:30
Temperature (°C): 21 Humidity (%): 61 Approved by:



Frequency (MHz): 2440.00 Antenna Polarity: Horizontal Average Value (dBm): -9.76
Maximum Value (dBm): -4.46 Maximum Value (degree): 208
Minimum Value (dBm): -32.17 Minimum Value (degree): 2

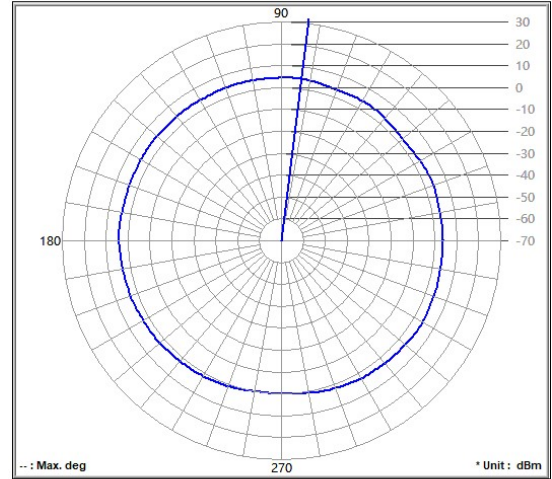
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Brand / Model : YR0109
Remark : EUT Y-Z 2440MHz,Setting=Default,Conducted Power =0 SN:2448C EN7D878
Sample No. WTW241224/010Q10N07
Tested by : Vanness Huang

Location: RF Chamber 1 Date: 2025/1/2 Time: 下午 01:40:00
Temperature (°C): 21 Humidity (%): 61 Approved by:



Frequency (MHz): 2440.00 Antenna Polarity: Vertical Average Value (dBm): 3.29
Maximum Value (dBm): 4.57 Maximum Value (degree): 83
Minimum Value (dBm): -0.16 Minimum Value (degree): 262

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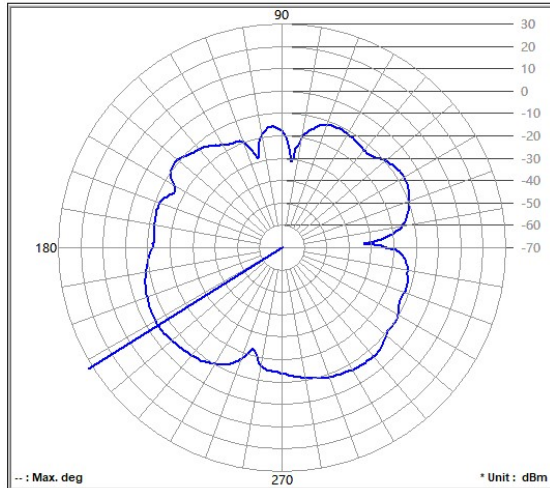
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Brand / Model : YR0109
Remark : EUT Y-Z 2480MHz,Setting=Default,Conducted Power =0 SN:2448C EN7D878
Sample No. WTW241224/010Q10N07
Tested by : Vanness Huang

Location: RF Chamber 1 Date: 2025/1/2 Time: 下午 01:45:04
Temperature (°C): 21 Humidity (%): 61 Approved by:



Frequency (MHz): 2480.00 Antenna Polarity: Horizontal Average Value (dBm): -10.11
Maximum Value (dBm): -4.66 Maximum Value (degree): 212
Minimum Value (dBm): -33.20 Minimum Value (degree): 3

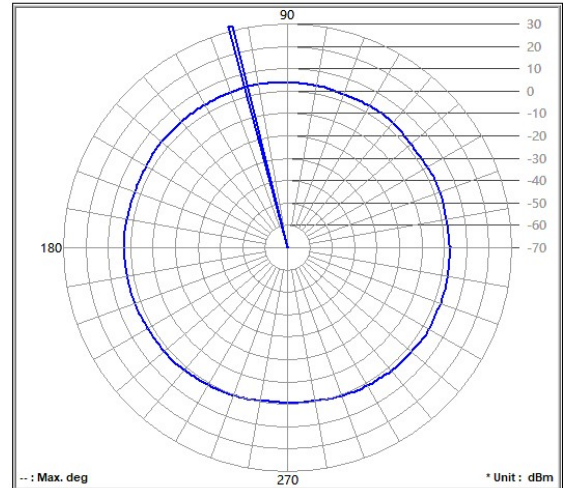
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Brand / Model : YR0109
Remark : EUT Y-Z 2480MHz,Setting=Default,Conducted Power =0 SN:2448C EN7D878
Sample No. WTW241224/010Q10N07
Tested by : Vanness Huang

Location: RF Chamber 1 Date: 2025/1/2 Time: 下午 01:42:33
Temperature (°C): 21 Humidity (%): 61 Approved by:



Frequency (MHz): 2480.00 Antenna Polarity: Vertical Average Value (dBm): 2.43
Maximum Value (dBm): 4.23 Maximum Value (degree): 104
Minimum Value (dBm): -0.80 Minimum Value (degree): 264

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