

Antenna Gain Measurement Report

Report No.: AGBDKG-WTW-P22100236

Model No.: MR0104

Received Date: 2022/9/15

Test Date: 2022/11/16

Issued Date: 2022/11/18

Applicant: LOGITECH FAR EAST LTD.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

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Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan

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Approved by : [Signature] , **Date:** 2022/11/18
May Chen / Manager

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Release Control Record

Issue No.	Description	Date Issued
AGBDKG-WTW-P22100236	Original release.	2022/11/18

1 EUT Antenna System Description

1.1 Antenna Information

Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
2.02	2.4~2.4835	PIFA	None

2 2D Antenna Pattern Measurement

2.1 Test Location

2D antenna pattern measurement in Fully Anechoic Chamber

2.2 Test Measurement procedure

CISPR 16-1-6

ANSI 63.10-2013 clause 13

KDB 412172 D01 Determining ERP and EIRP v01r01

2.3 Test Setup Diagram @ Fully Anechoic Chamber

The 2D antenna pattern measurement is using the test system (refer to Figure 1). The EUT is positioned on center of turntable, for Free Space only in fully anechoic chamber. Data (Raw Value) is recorded using the spectrum analyzer at each position.

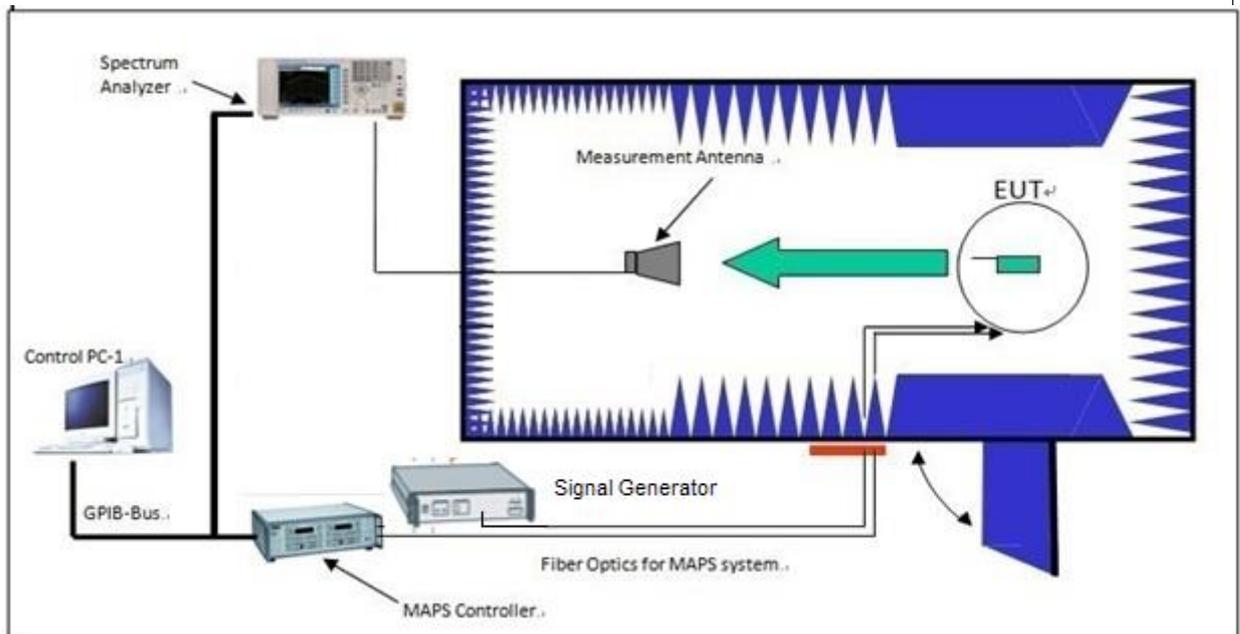


Figure 1. 2D antenna pattern test system.

2.4 Test Setup Diagram for EUT

Controlling software (RF Sample with Receiver [Number Lock]) has been activated to set the EUT on specific status.
Please refer to the attached file (Test Setup Photo)

2.5 Test Instruments

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
PXA Signal Analyzer(3 Hz to 50 GHz) Keysight	N9030A	MY54490570	2022/6/20	2023/6/19
Software BVADT	Antenna Pattern V6.3	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208411	NA	NA
ESG Vector signal generator Agilent	E4438C	MY45094468	2021/11/21	2022/11/20
RF PreAmplifier HP	8449B	3008A01281	2022/1/4	2023/1/3
Horn Antenna Schwarzbeck	BBHA9120-D1	D124	2022/11/13	2023/11/12

- NOTE:**
1. The test was performed in RF Fully Chamber No. 1.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: 2022/11/16

2.6 Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Uncertainty
Radiated emission of receiver, valid between 1 GHz and 18 GHz	±4.9 dB

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.7 Test Procedure

- Connect the EUT antenna connector to the signal generator.
- Fasten the EUT to the locator in the center of the turntable, leaving only free space.
- Transmit a 0 dBm power level from the signal generator to the EUT antenna connector. Please refer to Figure 2 for detailed configuration.
- Make sure the transmit signal is stable at the maximum RF power level.
- Read the power level on the spectrum analyzer and record it in the following locations.
- The EUT is placed on a turntable that rotates 360° in 1° steps. Measure the E and H plane patterns.
- The turntable should be stepped from 0° to 360° with a maximum angular resolution of 1°. The 360° measurement should be compared to the 0° value to complete the pattern.
- According to section 2.3 of KDB 412172 D01 Determining ERP and EIRP v01r01, 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.

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

where:

P_{SigGen} = power setting of the signal generator that produces the same received power reading as the EUT, in dBm.

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

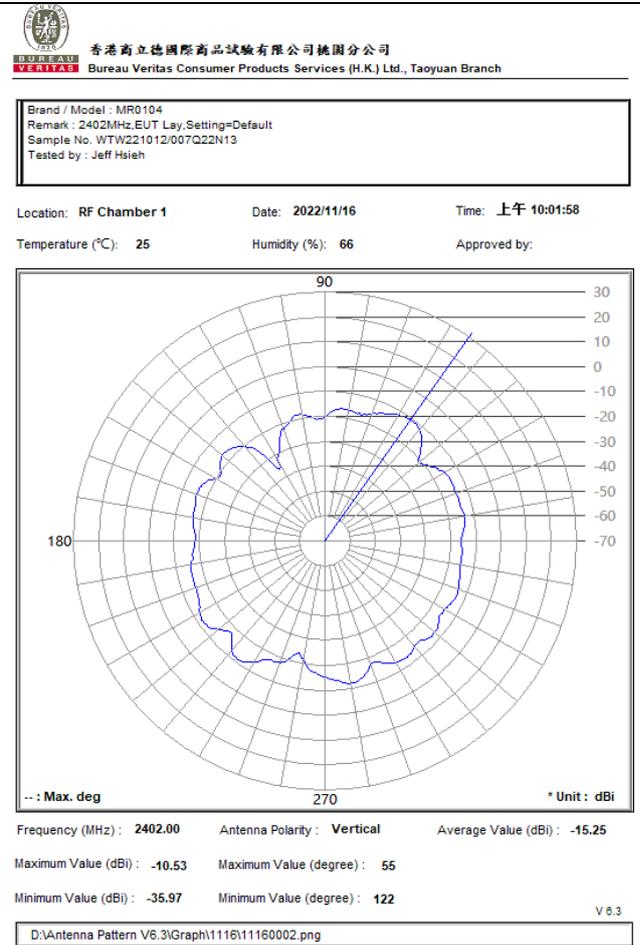
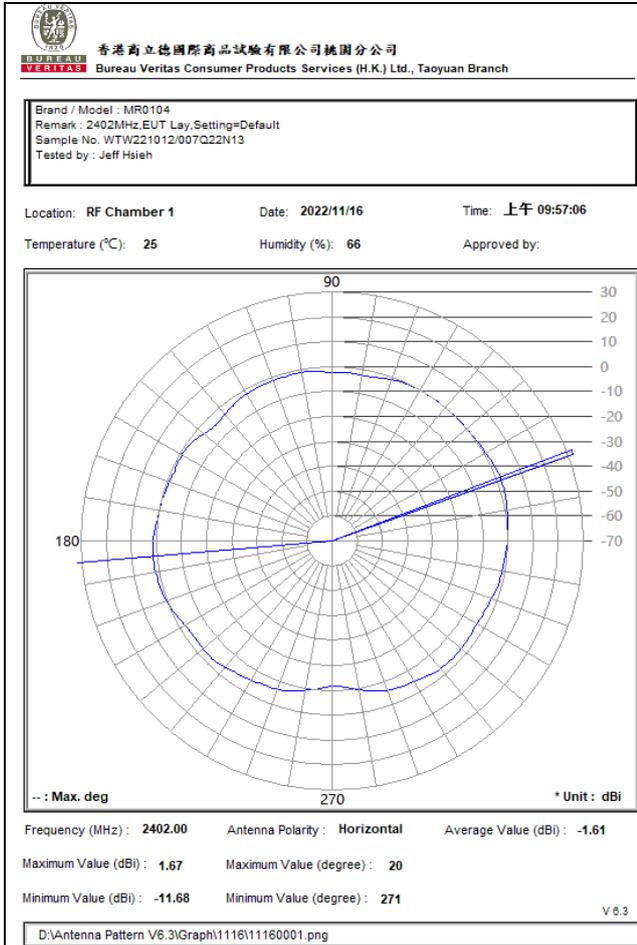
L_C = signal loss in the cable connecting the signal generator to the substitute antenna, in dB.

2.8 Test Result

Tested By	Jeff Hsieh
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Frequency (MHz)	Max Gain (dBi)
2402	1.67
2442	1.92
2481	2.02

2.9 2D Pattern Test Plots

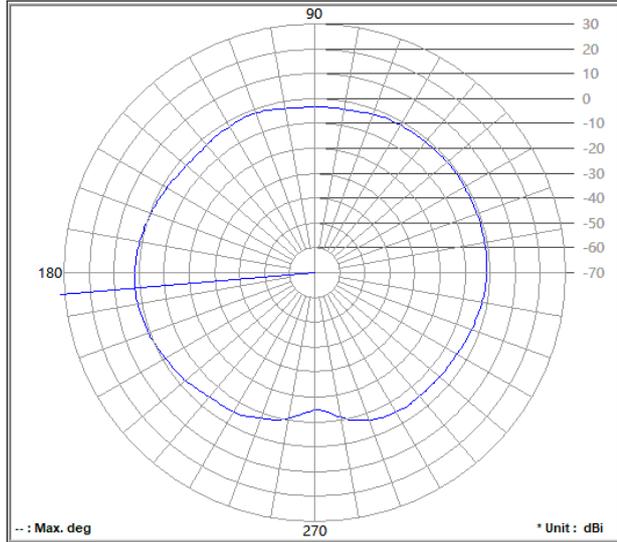




香港高立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

Brand / Model : MR0104
Remark : 2442MHz,EUT Lay,Setting=Default
Sample No. WTW221012/007Q22N13
Tested by : Jeff Hsieh

Location: RF Chamber 1 Date: 2022/11/16 Time: 上午 10:18:07
Temperature (°C): 25 Humidity (%): 66 Approved by:



-- : Max. deg 270 * Unit : dBi
Frequency (MHz): 2442.00 Antenna Polarity : Horizontal Average Value (dBi) : -2.28
Maximum Value (dBi) : 1.92 Maximum Value (degree) : 185
Minimum Value (dBi) : -14.88 Minimum Value (degree) : 271

V 6.3

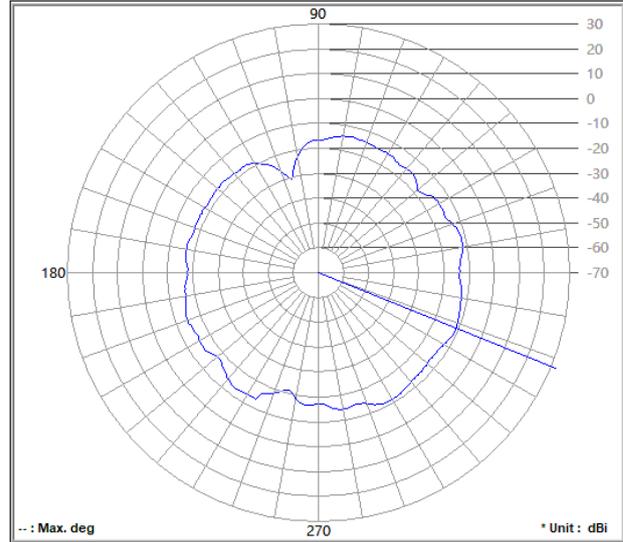
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Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

Brand / Model : MR0104
Remark : 2442MHz,EUT Lay,Setting=Default
Sample No. WTW221012/007Q22N13
Tested by : Jeff Hsieh

Location: RF Chamber 1 Date: 2022/11/16 Time: 上午 10:07:02
Temperature (°C): 25 Humidity (%): 66 Approved by:



-- : Max. deg 270 * Unit : dBi
Frequency (MHz): 2442.00 Antenna Polarity : Vertical Average Value (dBi) : -14.80
Maximum Value (dBi) : -10.62 Maximum Value (degree) : 338
Minimum Value (dBi) : -31.12 Minimum Value (degree) : 106

V 6.3

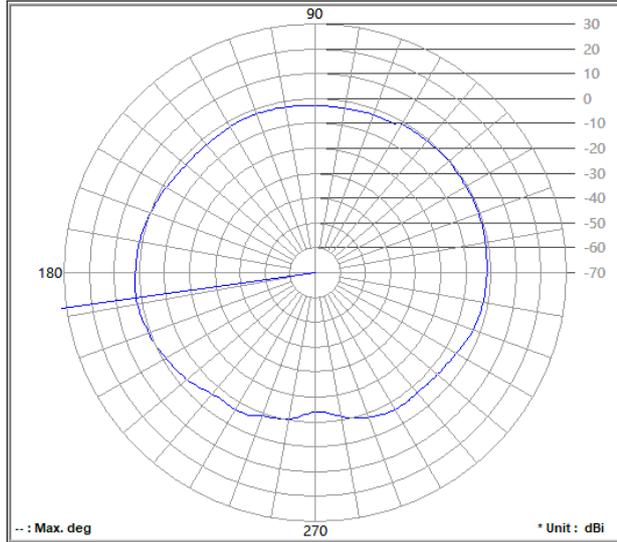
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Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

Brand / Model : MR0104
Remark : 2481MHz,EUT Lay,Setting=Default
Sample No. WTW221012/007Q22N13
Tested by : Jeff Hsieh

Location: RF Chamber 1 Date: 2022/11/16 Time: 上午 10:46:49
Temperature (°C): 25 Humidity (%): 66 Approved by:



Frequency (MHz): 2481.00 Antenna Polarity : Horizontal Average Value (dBi) : -2.28
Maximum Value (dBi) : 2.02 Maximum Value (degree) : 188
Minimum Value (dBi) : -13.97 Minimum Value (degree) : 272

V 6.3

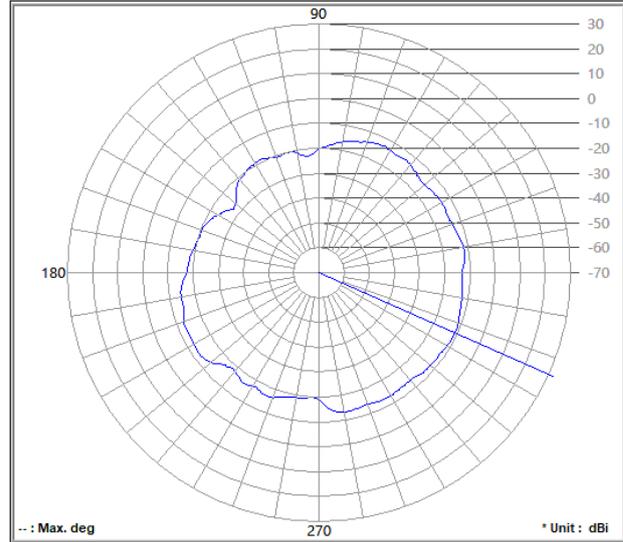
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Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

Brand / Model : MR0104
Remark : 2481MHz,EUT Lay,Setting=Default
Sample No. WTW221012/007Q22N13
Tested by : Jeff Hsieh

Location: RF Chamber 1 Date: 2022/11/16 Time: 上午 10:53:14
Temperature (°C): 25 Humidity (%): 66 Approved by:



Frequency (MHz): 2481.00 Antenna Polarity : Vertical Average Value (dBi) : -14.73
Maximum Value (dBi) : -10.50 Maximum Value (degree) : 336
Minimum Value (dBi) : -27.64 Minimum Value (degree) : 143

V 6.3

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3 Appendix - Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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