

## 低功率射頻電機測試報告

報告編號:

RT190702C09

申請者

u-blox AG

產品名稱

Bluetooth Low Energy module

型號

NINA-B316

製造廠商

u-blox AG

商標或廠牌

u-blox

該產品樣品試驗

國家通訊傳播委員會低功率射頻電機技術規範

依據之試驗標準

107 年 1 月修訂

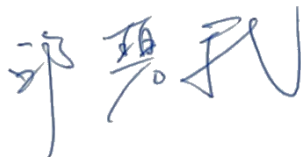
試驗結果

合格

香港商立德國際商品試驗有限公司桃園分公司 林口實驗室

日期 108 年 08 月 01 日

報告簽署人簽章:



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報告發行紀錄

| Issue No.   | Description      | Date Issued     |
|-------------|------------------|-----------------|
| RT190702C09 | Original release | 108 年 08 月 01 日 |

# 證 明 書

發行日期：108 年 08 月 01 日

產 品 名 稱：Bluetooth Low Energy module  
商 標：u-blox  
型 號：NINA-B316  
申 請 者：u-blox AG  
量 測 規 範：低功率射頻電機技術規範 LP0002  
ANSI C63.10-2013

香港商立德國際商品試驗有限公司桃園分公司在此證明上述待測設備樣品一組(型號：NINA-B316)，收件日期 108 年 07 月 02 日，於 108 年 07 月 23 日至 108 年 07 月 29 日，已在本公司的標準測試場地完成量測。報告中所描述之測試結果和待測設備的架構組合，均根據樣品實際的量測情況作詳實的記錄。

立德桃園分公司依“低功率射頻電機技術規範”、“低功率電波輻射性電機管理辦法”及“電信管制射頻器材審驗辦法”製作測試結果報告。

特 此 證 明 ！

報告製作者：



吳宜芳 / 主任

， 日 期： 108 年 08 月 01 日

審 核 者：



邱碧民 / 專案工程師

， 日 期： 108 年 08 月 01 日

## 香港商立德國際商品試驗有限公司桃園分公司

實驗室地址：新北市林口區嘉寶里 14 鄰 47-2 號

此份報告不得摘錄複製，除全份  
複製外，需經實驗室書面同意。



## 1 低功率射頻電機量測記錄表

申請廠商: u-blox AG

製造廠商: u-blox AG

申請廠商地址: Zuercherstrasse 68, 8800 Thalwil, Switzerland

產品名稱: Bluetooth Low Energy module

廠牌: u-blox

型號: NINA-B316

量測單位名稱: 香港商立德國際商品試驗有限公司桃園分公司

林口實驗室華亞檢測部

量測單位地址: 桃園市龜山區文化里華亞二路 19 號

量測單位認可編號: TAF 2021 (9 kHz ~ 40 GHz)

量測規範: 低功率射頻電機技術規範 LP0002

ANSI C63.10-2013

KDB 558074

### Bluetooth LE 頻段概要

| 項次 | 量測項目     | 規 範                    | 量測結果判定 |
|----|----------|------------------------|--------|
| 1  | 帶外發射     | 低功率射頻電機技術規範 3.10.1.5 節 | 合格     |
| 2  | 電源線傳導干擾  | 低功率射頻電機技術規範 2.3 節      | 合格     |
| 3  | 6 dB 頻寬  | 低功率射頻電機技術規範 3.10.1.6 節 | 合格     |
| 4  | 峰值傳導輸出功率 | 低功率射頻電機技術規範 3.10.1.2 節 | 合格     |
| 5  | 功率頻譜密度   | 低功率射頻電機技術規範 3.10.1.6 節 | 合格     |

### NFC 頻段概要 (Rx only)

| 項次 | 量測項目    | 規 範                          | 量測結果判定 |
|----|---------|------------------------------|--------|
| 1  | 不必要之發射  | 低功率射頻電機技術規範 2.8 節, 3.2.1.2 節 | 合格     |
| 2  | 電源線傳導干擾 | 低功率射頻電機技術規範 2.3 節            | 合格     |
| 3  | 天線之要求   | 低功率射頻電機技術規範 2.2 節            | 合格     |

### 最大暴露允許值(Maximum Permissible Exposure, MPE)

| 項次 | 量測項目  | 規 範                   | 量測結果判定 |
|----|-------|-----------------------|--------|
| 1  | 電波暴露量 | 低功率射頻電機技術規範第 5.20.2 節 | 合格     |

備註: 量測結果之判定不考慮量測不確定度的貢獻。

## 2 一般敘述

### 2.1 待測設備

|                 |                             |                              |
|-----------------|-----------------------------|------------------------------|
| 產品名稱：           | Bluetooth Low Energy module |                              |
| 型號：             | NINA-B316                   |                              |
| 額定電源：           | 5 Vdc (adapter)             |                              |
| 調變方式：           | Bluetooth LE 4.0            | GFSK                         |
|                 | Bluetooth LE 5.0            | GFSK                         |
|                 | NFC (Rx only)               | ASK                          |
| 傳輸速率：           | Bluetooth LE 4.0            | 1 Mbps                       |
|                 | Bluetooth LE 5.0            | 2 Mbps                       |
| 載波頻率：           | Bluetooth LE 4.0            | 2402 ~ 2480 MHz              |
|                 | Bluetooth LE 5.0            | 2402 ~ 2480 MHz              |
|                 | NFC (Rx only)               | 13.56 MHz                    |
| 頻道數：            | Bluetooth LE 4.0            | 40                           |
|                 | Bluetooth LE 5.0            | 40                           |
|                 | NFC (Rx only)               | 1                            |
| 發射功率：           | Bluetooth LE 4.0            | 7.75 dBm                     |
|                 | Bluetooth LE 5.0            | 7.78 dBm                     |
| 發射功率<br>(電場強度)： | NFC (Rx only)               | 39.47 dBuV/m (於 3 公尺距離) (QP) |
| 天線種類：           | 見註 1                        |                              |
| 電源線類別：          | N/A                         |                              |
| 信號線類別：          | 見註 2                        |                              |
| 配件：             | 見註 2                        |                              |

註：

1. 此待測設備搭配測試的天線，其資料如下：

|           | 頻帶 (MHz)    | 天線型式 | 天線型號                     | 商標     | 接頭型式 | 增益 (dBi) |
|-----------|-------------|------|--------------------------|--------|------|----------|
| Bluetooth | 2402 ~ 2480 | PCB  | u-blox PCB Trace Antenna | ProAnt | N/A  | 3        |
| NFC       | 13.56       | Loop | EMMY-W1 Rev.B            | u-blox | N/A  | -        |

2. 此待測設備搭配使用之配件請參閱產品照編號: 190702C08

3. 此報告中，場強輻射量測經過評估後以下列測試模式進行最終量測。

| 量測項目                               | 發射           | 接收    |
|------------------------------------|--------------|-------|
| 2402 ~ 2480 MHz (Bluetooth LE 4.0) |              |       |
| 1 GHz 以上量測                         | Ch 0, 19, 39 | Ch 39 |
| 其它不必要之訊號                           | Ch 39        | Ch 39 |
| 2402 ~ 2480 MHz (Bluetooth LE 5.0) |              |       |
| 1 GHz 以上量測                         | Ch 0, 19, 39 | Ch 39 |
| 其它不必要之訊號                           | Ch 39        | Ch 39 |
| 13.56 MHz (NFC)                    |              |       |
| 1 GHz 以上量測                         | --           | --    |
| 其它不必要之訊號                           | --           | Ch 1  |

4. Bluetooth LE傳輸模式，場強輻射量測及電源線傳導干擾量測之外的測試項目，以GFSK調變技術進行測試並記錄最終量測結果於報告中。

5. 此報告中，測試模式評估如下

- (1) 電源線傳導干擾量測經預掃後以模式3具有較大干擾值，故以其模式進行最終測試。
- (2) 場強輻射量測以模式1~3評估完整測試。

| 模式 | 測試狀態                            |
|----|---------------------------------|
| 1  | BT LE 4.0 + USB Cable + Adapter |
| 2  | BT LE 5.0 + USB Cable + Adapter |
| 3  | NFC + USB Cable + Adapter       |

6. 此待測設備，經評估三個正交軸方位評估測試擺設方式：平躺、垂直、側放，其各擺放最大干擾值之位置如下表，故以此擺放方式進行最終量測，並將測試結果紀錄。

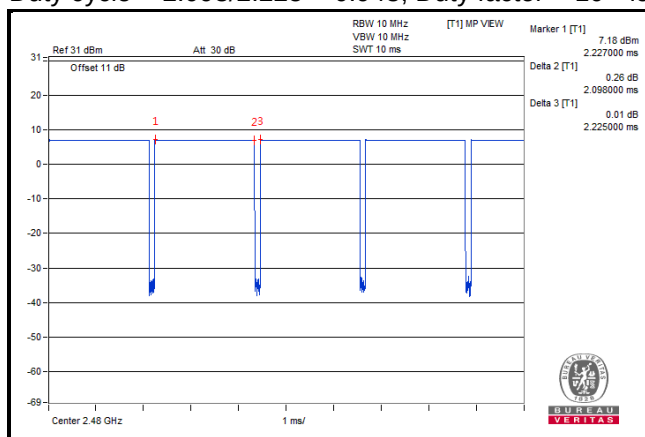
|      | Bluetooth LE | NFC |
|------|--------------|-----|
| 擺放方式 | 平躺           | 垂直  |

7. Duty cycle of test signal.

BT LE頻段

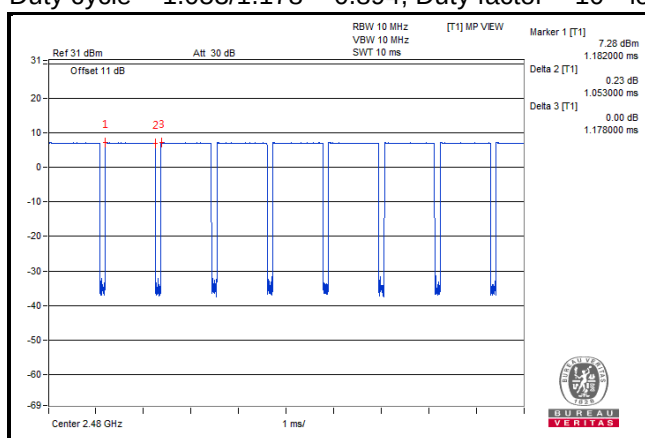
<LE 4.0>

Duty cycle =  $2.098/2.225 = 0.943$ , Duty factor =  $10 * \log(1/0.943) = 0.25$



<LE 5.0>

Duty cycle =  $1.053/1.178 = 0.894$ , Duty factor =  $10 * \log(1/0.894) = 0.49$



此裝置各頻道的中心頻率如下：

Bluetooth LE 頻段：

| 頻道 | 對應頻率<br>(MHz) | 頻道 | 對應頻率<br>(MHz) | 頻道 | 對應頻率<br>(MHz) | 頻道 | 對應頻率<br>(MHz) | 頻道 | 對應頻率<br>(MHz) |
|----|---------------|----|---------------|----|---------------|----|---------------|----|---------------|
| 0  | 2402          | 8  | 2418          | 16 | 2434          | 24 | 2450          | 32 | 2466          |
| 1  | 2404          | 9  | 2420          | 17 | 2436          | 25 | 2452          | 33 | 2468          |
| 2  | 2406          | 10 | 2422          | 18 | 2438          | 26 | 2454          | 34 | 2470          |
| 3  | 2408          | 11 | 2424          | 19 | 2440          | 27 | 2456          | 35 | 2472          |
| 4  | 2410          | 12 | 2426          | 20 | 2442          | 28 | 2458          | 36 | 2474          |
| 5  | 2412          | 13 | 2428          | 21 | 2444          | 29 | 2460          | 37 | 2476          |
| 6  | 2414          | 14 | 2430          | 22 | 2446          | 30 | 2462          | 38 | 2478          |
| 7  | 2416          | 15 | 2432          | 23 | 2448          | 31 | 2464          | 39 | 2480          |

NFC 頻段：

| 頻道 | 對應頻率<br>(MHz) |
|----|---------------|
| 1  | 13.56         |

詳細之規格請參考使用說明書。

## 2.2 輔助測試之週邊設備描述

待測設備於受測時均接上其所屬的配件或一般用途之相關設備；下列輔助設備或配件測試中所使用的配備，以形成一個代表待測物實際運作的受測系統。

| No. | Product      | Brand   | Model No. | Serial No.     | FCC ID    |
|-----|--------------|---------|-----------|----------------|-----------|
| 1   | Test Fixture | Ublox   | N/A       | UBXH60-0000448 | N/A       |
| 2   | Smart Phone  | Samsung | N/A       | N/A            | A3LSN920A |

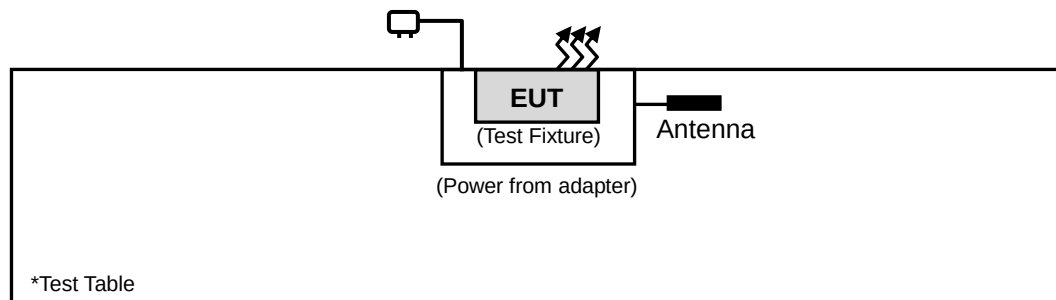
| No. | Signal Cable Description Of The Above Support Units |
|-----|-----------------------------------------------------|
| 1   | N/A                                                 |
| 2   | N/A                                                 |

NOTE:

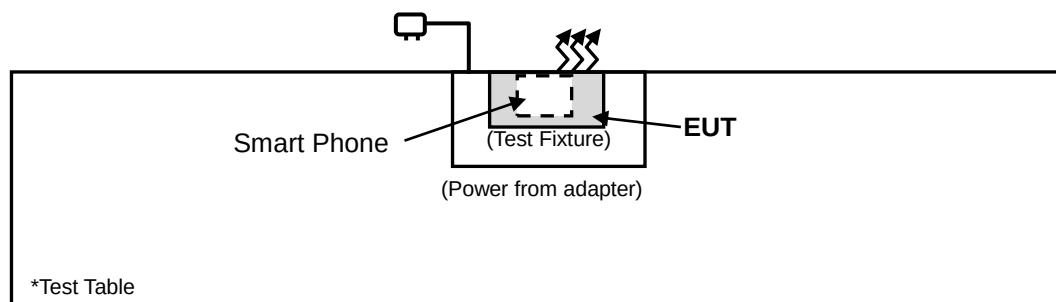
1. All power cords of the above support units are non shielded (1.8m).

## 2.3 測試架構圖

### <Bluetooth LE>



### <NFC>



### 3 適用規範

#### 3.1 規範要求

##### ► Bluetooth LE 頻段部分：

##### (1) 傳導之規定

依據國家通訊傳播委員會低功率射頻電機技術規範之 2.3 節，電源傳導干擾之限制要求如下：

| 頻率(MHz)  | 傳導限制值 (dBuV)    |              |
|----------|-----------------|--------------|
|          | 準峰值(Quasi-peak) | 平均值(Average) |
| 0.15-0.5 | 66-56 (註)       | 56-46 (註)    |
| 0.5-5    | 56              | 46           |
| 5-30     | 60              | 50           |

(註)：隨頻率之對數遞減。

##### (2) 帶外發射之規定

依據國家通訊傳播委員會低功率射頻電機技術規範 3.10.1.5 節之要求，操作頻帶範圍外之任意 100 kHz 內，發射機所產生的射頻功率相較於使用頻帶範圍中包含最高所需功率之 100 kHz 內的射頻功率，其衰減值限制如下：(1) 輸出功率以附件二之峰值輸出功率方式測量者，至少須衰減 20 dB，可使用射頻傳導或輻射方式測量。(2) 輸出功率以 3.10.1.2(1)(C)之最大傳導輸出功率測量方式者，至少須衰減 30 dB。此外，落於 2.7 禁用頻段之輻射發射，應符合 2.8 之規定。

| 頻率(兆赫)                 | 電場強度(微伏/公尺)   | 測距(公尺) |
|------------------------|---------------|--------|
| 0.009 - 0.490 (含)      | 2,400/頻率(千赫)  | 300    |
| 0.490 (不含) - 1.705 (含) | 24,000/頻率(千赫) | 30     |
| 1.705 (不含) - 30 (不含)   | 30            | 30     |
| 30 (含) - 88 (含)        | 100           | 3      |
| 88 (不含) - 216 (含)      | 150           | 3      |
| 216 (不含) - 960 (含)     | 200           | 3      |
| 960 (不含)以上             | 500           | 3      |

##### (3) 天線之規定

天線規格不受第 2.2 節規定之限制。

##### (4) 天線增益之要求

低功率發射機，依據國家通訊傳播委員會低功率射頻電機技術規範 3.10.1 節(3)之規定如下：

- (A) 進行固定式點對點操作時，其發射天線之方向性增益超過 6 dBi，每超過 3 dBi，最大傳導輸出功率限制值應降低 1 dB。
- (B) 天線以多向波束發射方式(含同時發射或循序發射)將訊號導向多個接收機或接收機群組時，應符合下列規定：
- (a) 非同時發射多向波束者，所有載波或頻道傳輸至所有天線陣列或陣列群之總和傳導輸出功率應符合 3.10.1.2 之功率限制值。如天線/天線陣列群之方向性增益超過 6 dBi，每超過 3 dBi，總和傳導輸出功率限制值應降低 1 dB。方向性增益值應計算如下：
- (i) 方向性增益值 =  $10\log(\text{天線陣列之單元數目}) + \text{各單元中最高之方向性增益值}$ 。
- (ii) 天線陣列間之遮蔽效應或波束干涉損失能充分佐證時，方向性增益得低於(i)計算數值。
- (b) 同時發射多向波束於相同或不同頻道者，其每一波束功率應符合(a)之功率限制值。如發射波束有重疊現象，功率應降低，以確保總和傳導輸出功率符合(a)之限制值。同時發射的所有波束總和傳導輸出功率不大於(a) 總和傳導輸出功率限制值加 8 dB。方向性增益值計算同(a)。

(c) 發射機之天線具備單向波束功能者，應符合(1)(A)及(3)後段之規定。

除(A)及(B)外，使用超過 6 dBi 方向增益之發射天線時，應依超過 6 dBi 天線方向增益的 dBi 總量，等量減少最大傳導輸出功率限制值。

(5) 6 dB 頻寬之要求

對使用數位調變技術(digital modulation techniques)系統之低功率發射機，依據國家通訊傳播委員會低功率射頻電機技術規範 3.10.1.6 節之規定，6 dB 頻寬至少應有 500 kHz。

(6) 峰值傳導輸出功率之要求

依據國家通訊傳播委員會低功率射頻電機技術規範 3.10.1.2 節之規定：

數位調變技術系統：1 W(含)以下。

(7) 功率頻譜密度之要求

依據國家通訊傳播委員會低功率射頻電機技術規範 3.10.1.6 節之規定，在使用頻率範圍之任一 3 kHz 頻寬內，由發射機傳導至天線之功率頻譜密度在任意傳輸期間內，皆小於或等於 8 毫分貝(dBm)，且應依 3.10.1.3 之方式降低功率頻譜密度限制值。

(8) 電波暴露量之評估

依據國家通訊傳播委員會低功率射頻電機技術規範 5.20.2 節之規定，若受測物於正常操作模式下，其發射機距離人體 20 公分以上者，可測試最大暴露允許值(Maximum Permissible Exposure, MPE)以證明其符合電波暴露量之要求。

限制值如下：

(1) 職業性/可控制之暴露

| 頻率範圍<br>(MHz)   | 電場強度<br>(V/m) | 磁場強度<br>(A/m) | 功率密度<br>(mW/cm <sup>2</sup> ) | 平均時間<br>(minutes) |
|-----------------|---------------|---------------|-------------------------------|-------------------|
| 0.3 - 3.0       | 614           | 1.63          | *100                          | 6                 |
| 3 - 30          | 1842/f        | 4.89/f        | *900/f <sup>2</sup>           | 6                 |
| 30 - 300        | 61.4          | 0.163         | 1.0                           | 6                 |
| 300 - 1,500     | ---           | ---           | f/300                         | 6                 |
| 1,500 - 100,000 | ---           | ---           | 5.0                           | 6                 |

註 1：標記\*表平面波等效功率密度。

註 2：f 表測試頻率，單位：MHz。

(2) 一般人/不可控制之暴露

| 頻率範圍<br>(MHz)   | 電場強度<br>(V/m) | 磁場強度<br>(A/m) | 功率密度<br>(mW/cm <sup>2</sup> ) | 平均時間<br>(minutes) |
|-----------------|---------------|---------------|-------------------------------|-------------------|
| 0.3 - 3.0       | 614           | 1.63          | *100                          | 30                |
| 3 - 30          | 1842/f        | 4.89/f        | *180/f <sup>2</sup>           | 30                |
| 30 - 300        | 27.5          | 0.073         | 1.0                           | 30                |
| 300 - 1,500     | ---           | ---           | f/1500                        | 30                |
| 1,500 - 100,000 | ---           | ---           | 1.0                           | 30                |

註 1：標記\*表平面波等效功率密度。

註 2：f 表測試頻率，單位：MHz。

►NFC 頻段部分：

(9) 傳導之規定

依據國家通訊傳播委員會低功率射頻電機技術規範之 2.3 節，電源傳導干擾之限制要求如下：

| 頻率(MHz)  | 傳導限制值 (dBuV)    |              |
|----------|-----------------|--------------|
|          | 準峰值(Quasi-peak) | 平均值(Average) |
| 0.15-0.5 | 66-56 (註)       | 56-46 (註)    |
| 0.5-5    | 56              | 46           |
| 5-30     | 60              | 50           |

(註)：隨頻率之對數遞減。

(10) 主波發射之規定

依據國家通訊傳播委員會低功率射頻電機技術規範 3.2.1.1 節之要求，距器材 30 公尺處之主波電場強度應小於或等於 15848 uV/m。

(11) 不必要之發射之規定

依據國家通訊傳播委員會低功率射頻電機技術規範 3.2.1.2 節之要求，應符合第 2.8 節之規定：

| 頻率(兆赫)                 | 電場強度(微伏/公尺)   | 測距(公尺) |
|------------------------|---------------|--------|
| 0.009 - 0.490 (含)      | 2,400/頻率(千赫)  | 300    |
| 0.490 (不含) - 1.705 (含) | 24,000/頻率(千赫) | 30     |
| 1.705 (不含) - 30 (不含)   | 30            | 30     |
| 30 (含) - 88 (含)        | 100           | 3      |
| 88 (不含) - 216 (含)      | 150           | 3      |
| 216 (不含) - 960 (含)     | 200           | 3      |
| 960 (不含)以上             | 500           | 3      |

(12) 頻率容許差度之規定

依據國家通訊傳播委員會低功率射頻電機技術規範 3.2.1.3 節之要求，應維持在主波頻率之 $\pm 0.01\%$ 以內。在正常供應電壓下，溫度在攝氏零下二十度至攝氏五十度間變化；及在攝氏二十度下，供應電壓在額定值之 $\pm 15\%$ 內變化時。以電池作業者，應以新電池測試，須符合第 5.18 節之規定。

(13) 天線之規定

低功率射頻電機之發射機或收發信機所使用之天線，除本規範章節中另有規定外，應為全固定、半固定式或以獨特之耦合(unique coupling)方式連接機體。製造者可設計供使用者因損壞而替換之天線，但不得設計或使用原認證以外之天線或可供引接各類電纜之標準天線插座或電氣連接頭，如：BNC、F type、N type、M type、UG type、RCA、SMA、SMB...等及其他各類工業或通訊標準接頭。

### 3.2 限制使用之頻帶

除本規範另有規定外，任何低功率射頻電機之主波皆不得使用下表所列各頻段之頻率；低功率射頻電機落於下表所列頻段之混附發射，其電場強度必須符合 2.8 之限制規定。

| 頻率(兆赫)        | 頻率(兆赫)        | 頻率(兆赫)        |
|---------------|---------------|---------------|
| 0.090~0.110   | 240.00~285.00 | 3332.0~3339.0 |
| 0.490~0.510   | 322.00~335.40 | 3345.8~3358.0 |
| 2.172~2.198   | 399.90~410.00 | 3500.0~4400.0 |
| 3.013~3.033   | 485.00~510.00 | 4500.0~5250.0 |
| 4.115~4.198   | 608.00~614.00 | 5350.0~5460.0 |
| 5.670~5.690   | 703.00~748.00 | 7250.0~7750.0 |
| 6.200~6.300   | 758.00~803.00 | 8025.0~8500.0 |
| 8.230~8.400   | 825.00~915.00 | 9000.0~9200.0 |
| 12.265~12.600 | 930.00~1240.0 | 9300.0~9500.0 |
| 13.340~13.430 | 1300.0~1427.0 | 10600~12700   |
| 14.965~15.020 | 1435.0~1626.5 | 13250~13400   |
| 16.700~16.755 | 1660.0~1785.0 | 14470~14500   |
| 19.965~20.020 | 1805.0~1880.0 | 15350~16200   |
| 25.500~25.700 | 1885.0~1900.0 | 17700~21400   |
| 37.475~38.275 | 1905.0~1985.0 | 22010~23120   |
| 73.500~75.400 | 2010.0~2025.0 | 23600~24000   |
| 108.00~138.00 | 2110.0~2170.0 | 31200~31800   |
| 149.90~150.05 | 2200.0~2300.0 | 36430~36500   |
| 156.70~156.90 | 2310.0~2390.0 | 38600 以上      |
| 162.01~167.17 | 2483.5~2900.0 |               |
| 167.72~173.20 | 3260.0~3267.0 |               |

## BLUETOOTH LE 頻段測試紀錄結果

### 4 帶外發射之量測

#### 4.1 適用標準

請見本報告 3.1 節第(2)項的規定。

#### 4.2 量測方法

在電波暗室，將待測物置於 0.8 米高的非金屬桌面，使其操作在工作狀態。接收天線置於 3 米距離。桌面要 360 度旋轉，另外接收天線從離地 1 米至 4 米升降變化，以找出最大的輻射電場強度，接收天線分別置於水平、垂直極化各執行測試一次。

Note: 對於 1 GHz 以上場強輻射的測試，待測物則置於 1.5 米高的非金屬桌面。

發射諧波：

Peak 為 RBW = 1 MHz, VBW = 3 MHz；

Average 為 RBW = 1 MHz, VBW = 1 kHz

接收諧波：

Below 1 GHz

Peak 為 RBW = 120 kHz, VBW = 360 kHz；Quasi-Peak 為 RBW = 120 kHz, VBW = 120 kHz

Above 1 GHz:

Peak 為 RBW = 1 MHz, VBW = 3 MHz；Average 為 RBW = 1 MHz, VBW = 1 kHz

其它不必要之訊號

Peak 為 RBW = 120 kHz, VBW = 360 kHz；Quasi-Peak 為 RBW = 120 kHz, VBW = 120 kHz

#### 4.3 量測儀器

| Description & Manufacturer                     | Model No.                  | Serial No.                    | Date Of Calibration | Due Date Of Calibration |
|------------------------------------------------|----------------------------|-------------------------------|---------------------|-------------------------|
| Test Receiver<br>Agilent                       | N9038A                     | MY51210203                    | Mar. 18, 2019       | Mar. 17, 2020           |
| Spectrum Analyzer<br>Agilent                   | N9010A                     | MY52220314                    | Dec. 13, 2018       | Dec. 12, 2019           |
| Broadband Horn Antenna<br>SCHWARZBECK          | BBHA 9170                  | 148                           | Nov. 25, 2018       | Nov. 24, 2019           |
| HORN Antenna<br>SCHWARZBECK                    | BBHA 9120D                 | 9120D-969                     | Nov. 25, 2018       | Nov. 24, 2019           |
| BILOG Antenna<br>SCHWARZBECK                   | VULB 9168                  | 9168-472                      | Nov. 23, 2018       | Nov. 22, 2019           |
| Fixed Attenuator<br>WOKEN                      | MDCS18N-10                 | MDCS18N-10-01                 | Apr. 15, 2019       | Apr. 14, 2020           |
| Loop Antenna                                   | EM-6879                    | 269                           | Sep. 07, 2018       | Sep. 06, 2019           |
| Preamplifier<br>EMCI                           | EMC001340                  | 980201                        | Oct. 12, 2018       | Oct. 11, 2019           |
| Preamplifier<br>EMCI                           | EMC 012645                 | 980115                        | Oct. 12, 2018       | Oct. 11, 2019           |
| Preamplifier<br>EMCI                           | EMC 184045                 | 980116                        | Oct. 12, 2018       | Oct. 11, 2019           |
| Preamplifier<br>EMCI                           | EMC 330H                   | 980112                        | Oct. 12, 2018       | Oct. 11, 2019           |
| RF Coaxial Cable<br>HUBER+SUHNNER              | EMC104-SM-SM-800<br>0&3000 | 140811+170717                 | Oct. 12, 2018       | Oct. 11, 2019           |
| RF Coaxial Cable<br>HUBER+SUHNNER              | SUCOFLEX 104               | EMC104-SM-SM-1<br>000(140807) | Oct. 12, 2018       | Oct. 11, 2019           |
| RF Coaxial Cable<br>Worken                     | 8D-FB                      | Cable-Ch10-01                 | Oct. 12, 2018       | Oct. 11, 2019           |
| Boresight Antenna Fixture                      | FBA-01                     | FBA-SIP01                     | NA                  | NA                      |
| Software<br>BV ADT                             | E3<br>6.120103             | NA                            | NA                  | NA                      |
| Antenna Tower<br>MF                            | MFA-440H                   | NA                            | NA                  | NA                      |
| Turn Table<br>MF                               | MFT-201SS                  | NA                            | NA                  | NA                      |
| Antenna Tower & Turn Table<br>Controller<br>MF | MF-7802                    | NA                            | NA                  | NA                      |

**NOTE:**

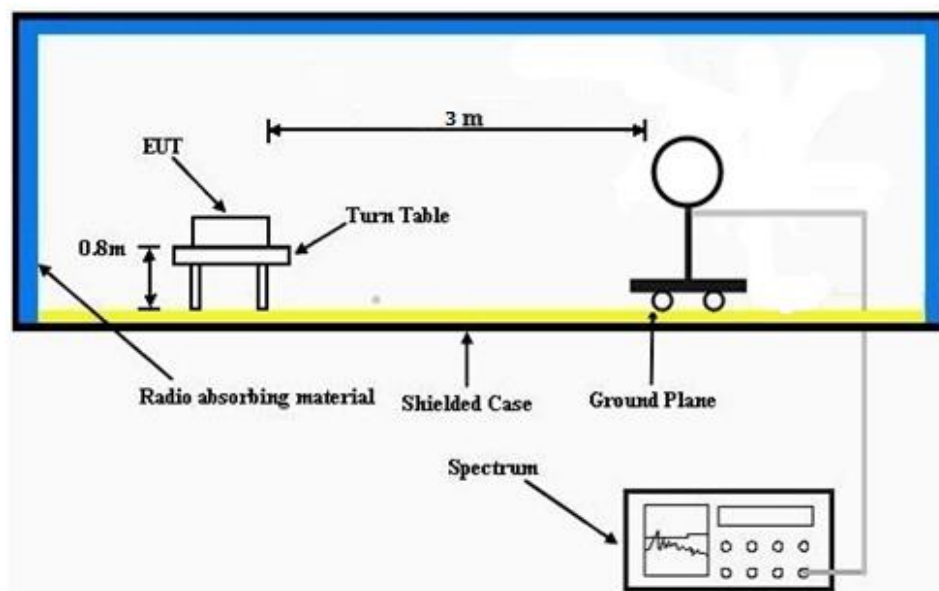
1. The calibration interval of the above test instruments is 12 or 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 10.
3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
5. The IC Site Registration No. is 7450F-10.

6. The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of  $k=2$ .

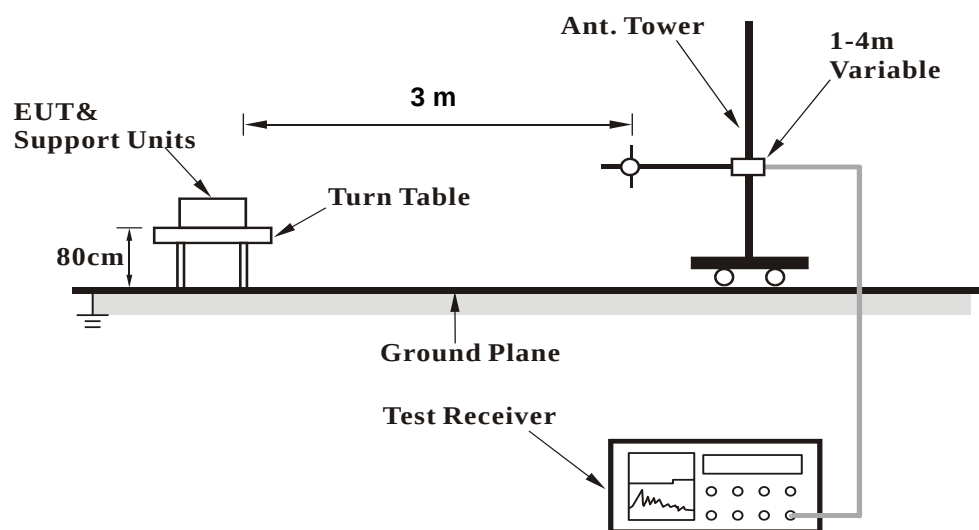
| Measurement        | Frequency         | Uncertainty |
|--------------------|-------------------|-------------|
| Radiated emissions | 9 kHz ~ 30 MHz    | 3.04 dB     |
|                    | 30 MHz ~ 200 MHz  | 2.93 dB     |
|                    | 200 MHz ~1000 MHz | 2.95 dB     |
|                    | 1 GHz ~ 18 GHz    | 2.26 dB     |
|                    | 18 GHz ~ 40 GHz   | 1.94 dB     |

#### 4.4 測試配置

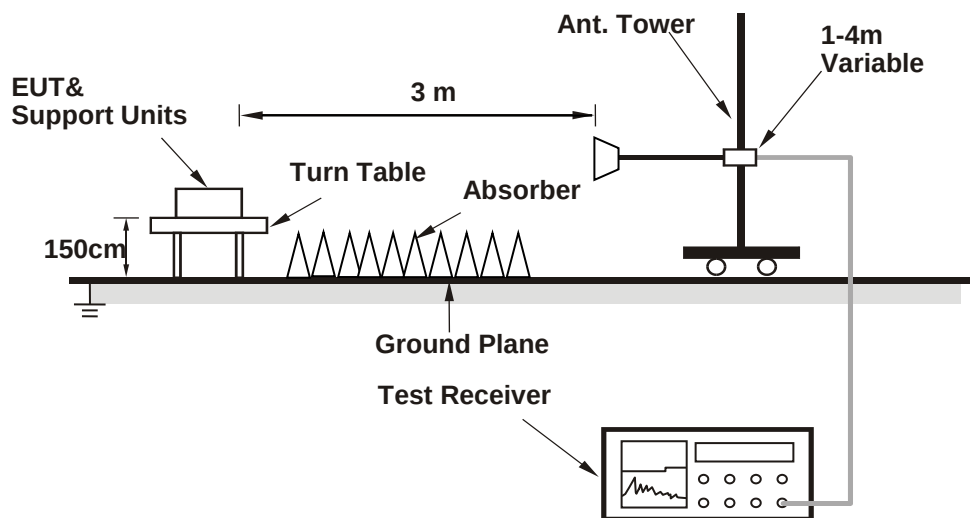
<Frequency Range 9 kHz ~ 30 MHz>



<Frequency Range below 1 GHz>



### <Frequency Range above 1 GHz>



#### 4.5 場強度之計算

結果值 Emission level (dBuV/m) = 機器讀值 Raw Value (dBuV) + 校正因子 Correction Factor (dB/m)

餘裕度 Margin(dB) = 結果值 Emission level (dBuV/m) - 限制值 Limit value (dBuV/m)

量測結果請見下頁。

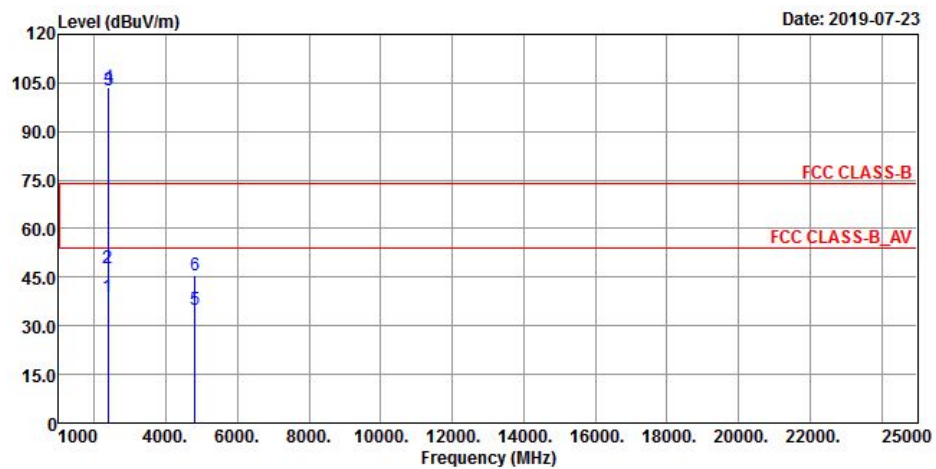
## 4.6 量測結果

### 4.6.1 發射諧波

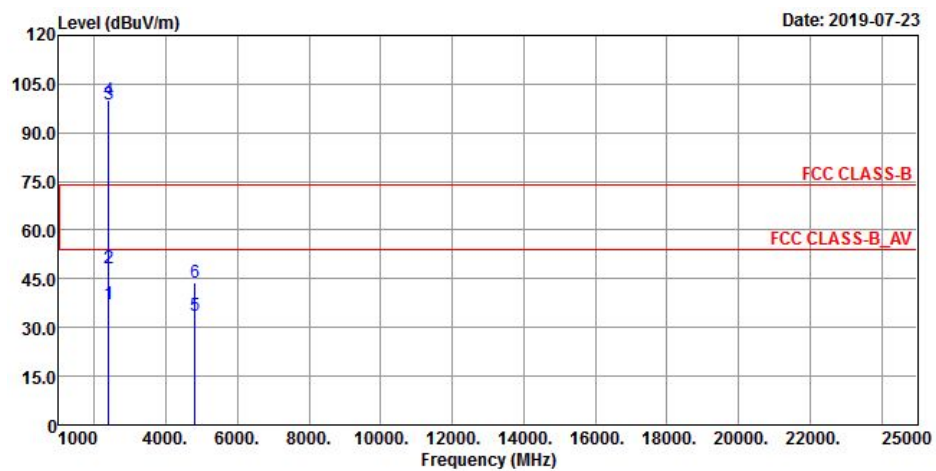
<LE 4.0>

| EUT Test Condition       |                    | Measurement Detail |                           |
|--------------------------|--------------------|--------------------|---------------------------|
| Channel                  | Channel 0          | Frequency Range    | 1 GHz ~ 25 GHz            |
| Input Power              | 110 Vac, 60 Hz     | Detector Function  | Peak (PK)<br>Average (AV) |
| Environmental Conditions | 25 deg. C, 65 % RH | Tested By          | Tim Chen                  |

#### Horizontal



#### Vertical



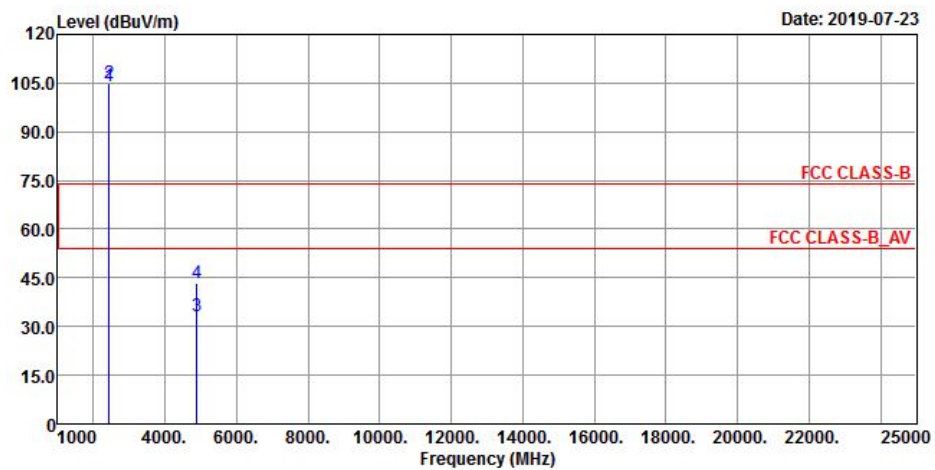
| Antenna Polarity & Test Distance: Horizontal at 3 m |                         |                   |               |                |             |                     |                      |         |
|-----------------------------------------------------|-------------------------|-------------------|---------------|----------------|-------------|---------------------|----------------------|---------|
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 2370.2                                              | 38.84                   | 43.73             | -4.89         | 54             | -15.16      | 155                 | 198                  | Average |
| 2370.2                                              | 47.85                   | 52.74             | -4.89         | 74             | -26.15      | 155                 | 198                  | Peak    |
| 2402                                                | 102.57                  | 107.57            | -5            |                |             | 155                 | 198                  | Average |
| 2402                                                | 103.72                  | 108.72            | -5            |                |             | 155                 | 198                  | Peak    |
| 4804                                                | 34.87                   | 49.34             | -14.47        | 54             | -19.13      | 172                 | 106                  | Average |
| 4804                                                | 45.65                   | 60.12             | -14.47        | 74             | -28.35      | 172                 | 106                  | Peak    |
| Antenna Polarity & Test Distance: Vertical at 3 m   |                         |                   |               |                |             |                     |                      |         |
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 2390                                                | 37.19                   | 42.19             | -5            | 54             | -16.81      | 388                 | 272                  | Average |
| 2390                                                | 48.38                   | 53.38             | -5            | 74             | -25.62      | 388                 | 272                  | Peak    |
| 2402                                                | 98.84                   | 103.84            | -5            |                |             | 388                 | 272                  | Average |
| 2402                                                | 99.99                   | 104.99            | -5            |                |             | 388                 | 272                  | Peak    |
| 4804                                                | 33.56                   | 48.03             | -14.47        | 54             | -20.44      | 102                 | 341                  | Average |
| 4804                                                | 43.67                   | 58.14             | -14.47        | 74             | -30.33      | 102                 | 341                  | Peak    |

Remarks:

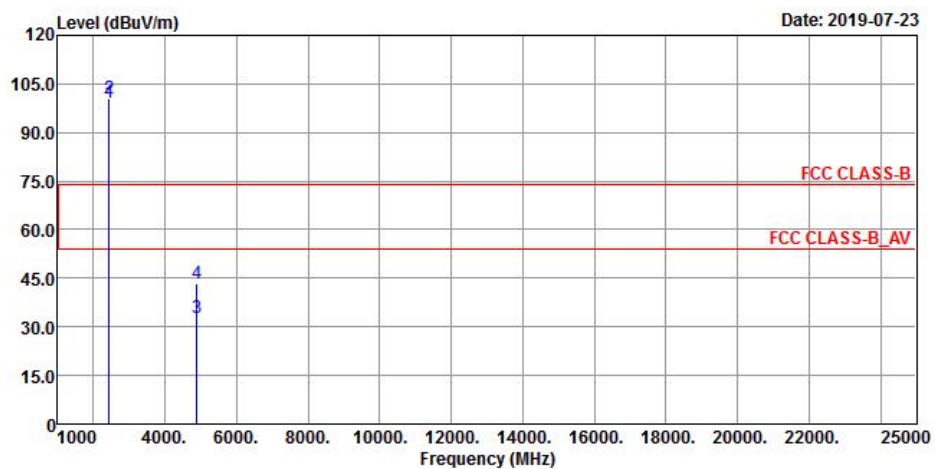
1. Emission Level = Read Level + Factor  
Margin Value = Emission Level – Limit value
2. 2402 MHz: Fundamental Frequency.
3. The other emission levels were very low against the limit.

| EUT Test Condition       |                    | Measurement Detail |                           |
|--------------------------|--------------------|--------------------|---------------------------|
| Channel                  | Channel 19         | Frequency Range    | 1 GHz ~ 25 GHz            |
| Input Power              | 110 Vac, 60 Hz     | Detector Function  | Peak (PK)<br>Average (AV) |
| Environmental Conditions | 25 deg. C, 65 % RH | Tested By          | Tim Chen                  |

### Horizontal



### Vertical



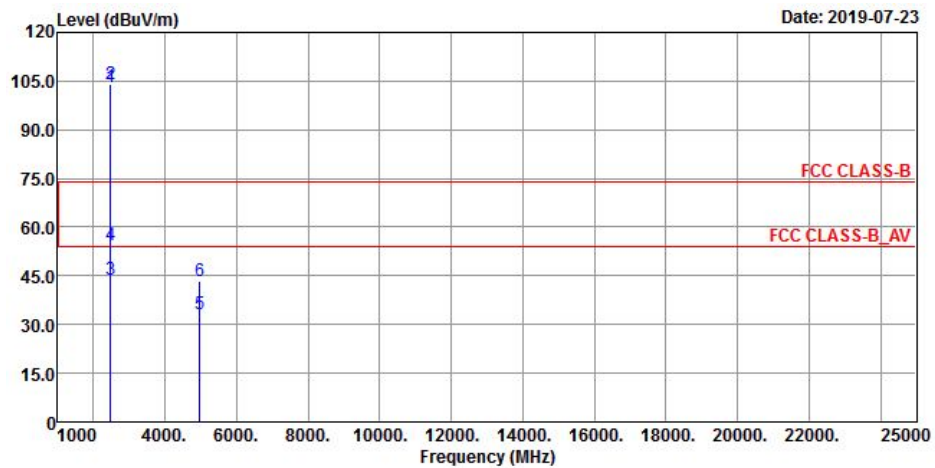
| Antenna Polarity & Test Distance: Horizontal at 3 m |                         |                   |               |                |             |                     |                      |         |
|-----------------------------------------------------|-------------------------|-------------------|---------------|----------------|-------------|---------------------|----------------------|---------|
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 2440                                                | 103.94                  | 108.92            | -4.98         |                |             | 133                 | 175                  | Average |
| 2440                                                | 105.13                  | 110.11            | -4.98         |                |             | 133                 | 175                  | Peak    |
| 4880                                                | 33.07                   | 47.15             | -14.08        | 54             | -20.93      | 133                 | 151                  | Average |
| 4880                                                | 43.48                   | 57.56             | -14.08        | 74             | -30.52      | 133                 | 151                  | Peak    |
| Antenna Polarity & Test Distance: Vertical at 3 m   |                         |                   |               |                |             |                     |                      |         |
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 2440                                                | 99.22                   | 104.2             | -4.98         |                |             | 303                 | 269                  | Average |
| 2440                                                | 100.39                  | 105.37            | -4.98         |                |             | 303                 | 269                  | Peak    |
| 4880                                                | 32.7                    | 46.78             | -14.08        | 54             | -21.3       | 109                 | 314                  | Average |
| 4880                                                | 43.36                   | 57.44             | -14.08        | 74             | -30.64      | 109                 | 314                  | Peak    |

Remarks:

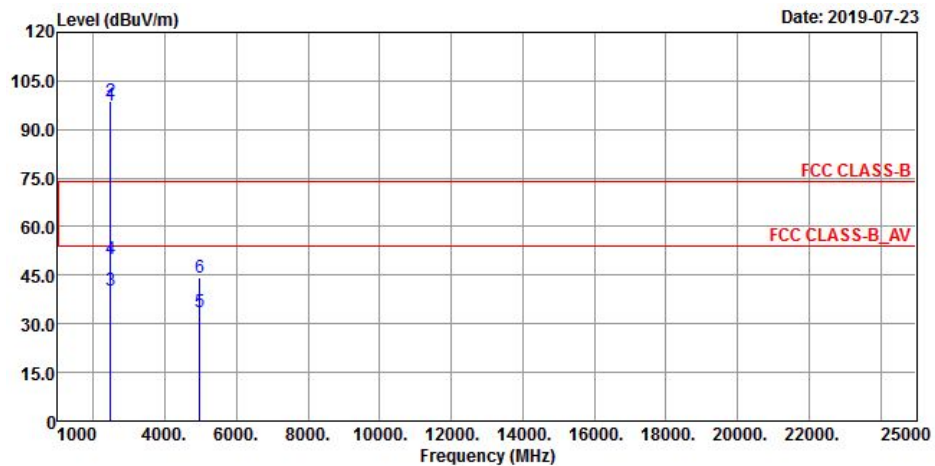
1. Emission Level = Read Level + Factor  
Margin Value = Emission Level – Limit value
2. 2440 MHz: Fundamental Frequency.
3. The other emission levels were very low against the limit.

| EUT Test Condition       |                    | Measurement Detail |                           |
|--------------------------|--------------------|--------------------|---------------------------|
| Channel                  | Channel 39         | Frequency Range    | 1 GHz ~ 25 GHz            |
| Input Power              | 110 Vac, 60 Hz     | Detector Function  | Peak (PK)<br>Average (AV) |
| Environmental Conditions | 25 deg. C, 65 % RH | Tested By          | Tim Chen                  |

### Horizontal



### Vertical



| Antenna Polarity & Test Distance: Horizontal at 3 m |                         |                   |               |                |             |                     |                      |         |
|-----------------------------------------------------|-------------------------|-------------------|---------------|----------------|-------------|---------------------|----------------------|---------|
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 2480                                                | 103.08                  | 107.93            | -4.85         |                |             | 264                 | 188                  | Average |
| 2480                                                | 104.24                  | 109.09            | -4.85         |                |             | 264                 | 188                  | Peak    |
| 2483.5                                              | 43.68                   | 48.53             | -4.85         | 54             | -10.32      | 264                 | 188                  | Average |
| 2483.5                                              | 54.41                   | 59.26             | -4.85         | 74             | -19.59      | 264                 | 188                  | Peak    |
| 4960                                                | 33.12                   | 47.01             | -13.89        | 54             | -20.88      | 188                 | 207                  | Average |
| 4960                                                | 43.37                   | 57.26             | -13.89        | 74             | -30.63      | 188                 | 207                  | Peak    |
| Antenna Polarity & Test Distance: Vertical at 3 m   |                         |                   |               |                |             |                     |                      |         |
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 2480                                                | 97.52                   | 102.37            | -4.85         |                |             | 400                 | 270                  | Average |
| 2480                                                | 98.65                   | 103.5             | -4.85         |                |             | 400                 | 270                  | Peak    |
| 2483.5                                              | 40.18                   | 45.03             | -4.85         | 54             | -13.82      | 400                 | 270                  | Average |
| 2483.5                                              | 50.01                   | 54.86             | -4.85         | 74             | -23.99      | 400                 | 270                  | Peak    |
| 4960                                                | 33.73                   | 47.62             | -13.89        | 54             | -20.27      | 129                 | 100                  | Average |
| 4960                                                | 44.42                   | 58.31             | -13.89        | 74             | -29.58      | 129                 | 100                  | Peak    |

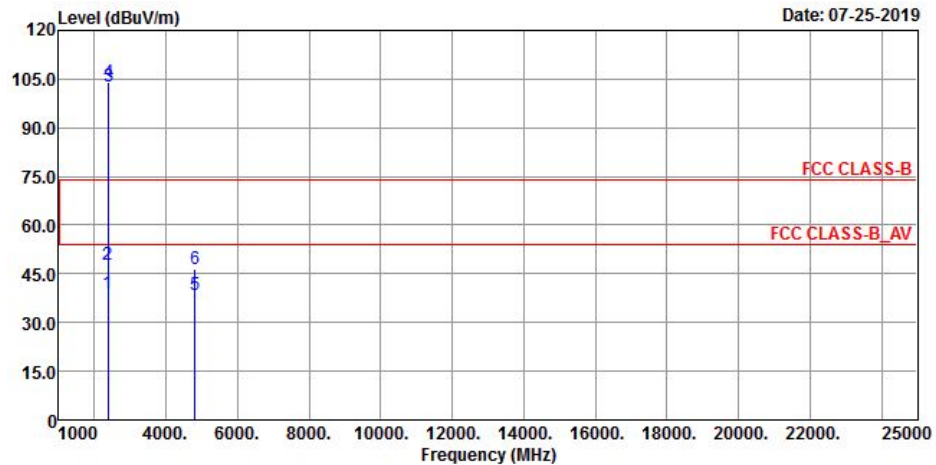
Remarks:

1. Emission Level = Read Level + Factor  
Margin Value = Emission Level – Limit value
2. 2480 MHz: Fundamental Frequency.
3. The other emission levels were very low against the limit.

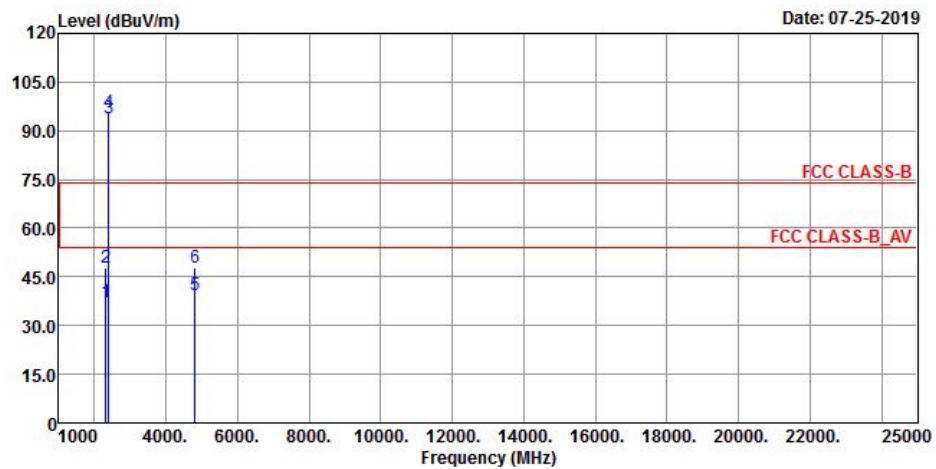
<LE 5.0>

| EUT Test Condition       |                    | Measurement Detail |                           |
|--------------------------|--------------------|--------------------|---------------------------|
| Channel                  | Channel 0          | Frequency Range    | 1 GHz ~ 25 GHz            |
| Input Power              | 110 Vac, 60 Hz     | Detector Function  | Peak (PK)<br>Average (AV) |
| Environmental Conditions | 25 deg. C, 65 % RH | Tested By          | Thomas Wei                |

### Horizontal



### Vertical



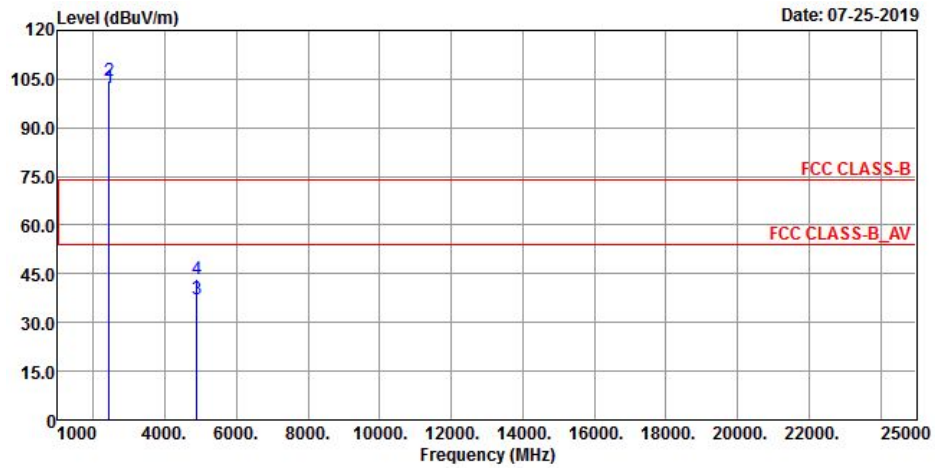
| Antenna Polarity & Test Distance: Horizontal at 3 m |                         |                   |               |                |             |                     |                      |         |
|-----------------------------------------------------|-------------------------|-------------------|---------------|----------------|-------------|---------------------|----------------------|---------|
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 2370.2                                              | 38.89                   | 43.78             | -4.89         | 54             | -15.11      | 172                 | 179                  | Average |
| 2370.2                                              | 47.82                   | 52.71             | -4.89         | 74             | -26.18      | 172                 | 179                  | Peak    |
| 2402                                                | 102.9                   | 107.9             | -5            |                |             | 172                 | 179                  | Average |
| 2402                                                | 104.2                   | 109.2             | -5            |                |             | 172                 | 179                  | Peak    |
| 4804                                                | 38.58                   | 53.05             | -14.47        | 54             | -15.42      | 125                 | 128                  | Average |
| 4804                                                | 46.71                   | 61.18             | -14.47        | 74             | -27.29      | 125                 | 128                  | Peak    |
| Antenna Polarity & Test Distance: Vertical at 3 m   |                         |                   |               |                |             |                     |                      |         |
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 2310.7                                              | 37.2                    | 41.66             | -4.46         | 54             | -16.8       | 244                 | 273                  | Average |
| 2310.7                                              | 47.66                   | 52.12             | -4.46         | 74             | -26.34      | 244                 | 273                  | Peak    |
| 2402                                                | 93.77                   | 98.77             | -5            |                |             | 244                 | 273                  | Average |
| 2402                                                | 95.61                   | 100.61            | -5            |                |             | 244                 | 273                  | Peak    |
| 4804                                                | 39.24                   | 53.71             | -14.47        | 54             | -14.76      | 123                 | 260                  | Average |
| 4804                                                | 48.01                   | 62.48             | -14.47        | 74             | -25.99      | 123                 | 260                  | Peak    |

Remarks:

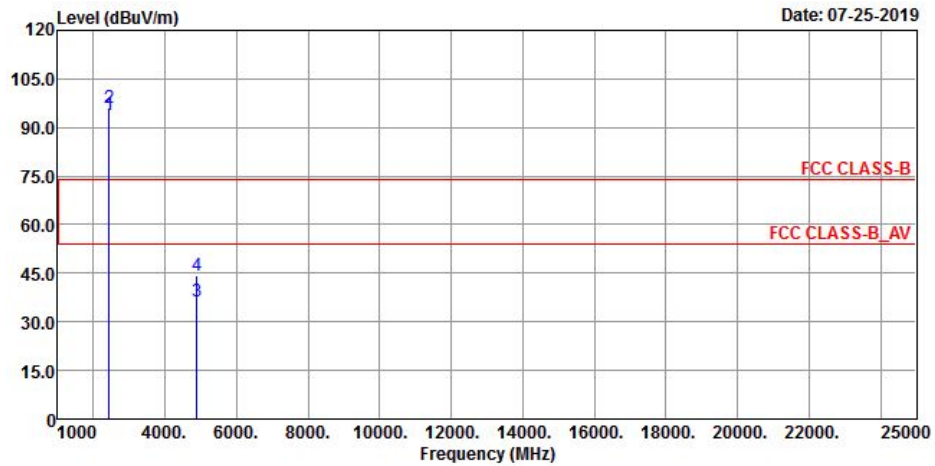
1. Emission Level = Read Level + Factor  
Margin Value = Emission Level – Limit value
2. 2402 MHz: Fundamental Frequency.
3. The other emission levels were very low against the limit.

| EUT Test Condition       |                    | Measurement Detail |                           |
|--------------------------|--------------------|--------------------|---------------------------|
| Channel                  | Channel 19         | Frequency Range    | 1 GHz ~ 25 GHz            |
| Input Power              | 110 Vac, 60 Hz     | Detector Function  | Peak (PK)<br>Average (AV) |
| Environmental Conditions | 25 deg. C, 65 % RH | Tested By          | Thomas Wei                |

### Horizontal



### Vertical



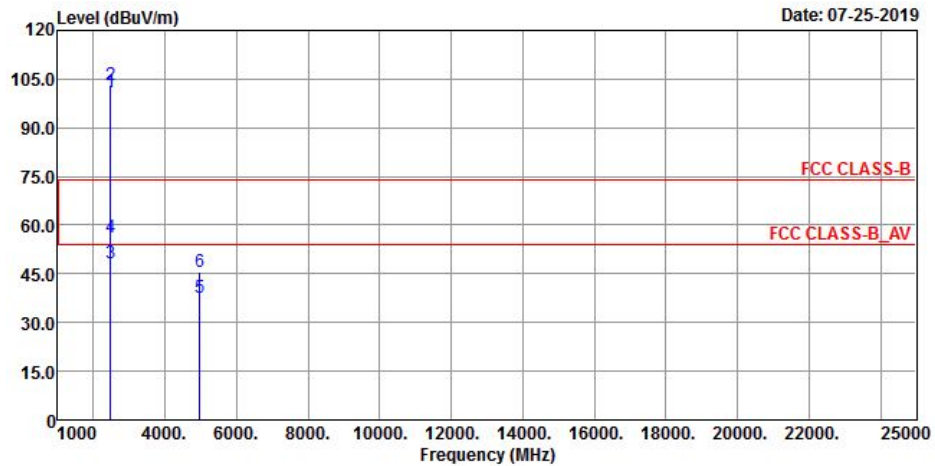
| Antenna Polarity & Test Distance: Horizontal at 3 m |                         |                   |               |                |             |                     |                      |         |
|-----------------------------------------------------|-------------------------|-------------------|---------------|----------------|-------------|---------------------|----------------------|---------|
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 2440                                                | 102.48                  | 107.46            | -4.98         |                |             | 123                 | 182                  | Average |
| 2440                                                | 104.41                  | 109.39            | -4.98         |                |             | 123                 | 182                  | Peak    |
| 4880                                                | 36.99                   | 51.07             | -14.08        | 54             | -17.01      | 165                 | 127                  | Average |
| 4880                                                | 43.61                   | 57.69             | -14.08        | 74             | -30.39      | 165                 | 127                  | Peak    |
| Antenna Polarity & Test Distance: Vertical at 3 m   |                         |                   |               |                |             |                     |                      |         |
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 2440                                                | 94.08                   | 99.06             | -4.98         |                |             | 240                 | 272                  | Average |
| 2440                                                | 95.91                   | 100.89            | -4.98         |                |             | 240                 | 272                  | Peak    |
| 4880                                                | 36.39                   | 50.47             | -14.08        | 54             | -17.61      | 146                 | 126                  | Average |
| 4880                                                | 44.25                   | 58.33             | -14.08        | 74             | -29.75      | 146                 | 126                  | Peak    |

Remarks:

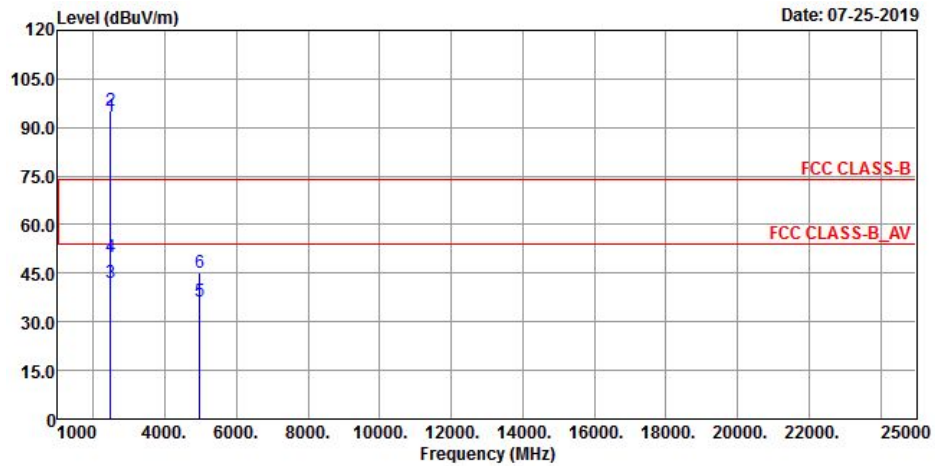
1. Emission Level = Read Level + Factor  
Margin Value = Emission Level – Limit value
2. 2440 MHz: Fundamental Frequency.
3. The other emission levels were very low against the limit.

| EUT Test Condition       |                    | Measurement Detail |                           |
|--------------------------|--------------------|--------------------|---------------------------|
| Channel                  | Channel 39         | Frequency Range    | 1 GHz ~ 25 GHz            |
| Input Power              | 110 Vac, 60 Hz     | Detector Function  | Peak (PK)<br>Average (AV) |
| Environmental Conditions | 25 deg. C, 65 % RH | Tested By          | Thomas Wei                |

### Horizontal



### Vertical



| Antenna Polarity & Test Distance: Horizontal at 3 m |                         |                   |               |                |             |                     |                      |         |
|-----------------------------------------------------|-------------------------|-------------------|---------------|----------------|-------------|---------------------|----------------------|---------|
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 2480                                                | 100.93                  | 105.78            | -4.85         |                |             | 232                 | 195                  | Average |
| 2480                                                | 103.09                  | 107.94            | -4.85         |                |             | 232                 | 195                  | Peak    |
| 2483.52                                             | 48.26                   | 53.11             | -4.85         | 54             | -5.74       | 232                 | 195                  | Average |
| 2483.52                                             | 56.32                   | 61.17             | -4.85         | 74             | -17.68      | 232                 | 195                  | Peak    |
| 4960                                                | 37.43                   | 51.32             | -13.89        | 54             | -16.57      | 146                 | 120                  | Average |
| 4960                                                | 45.39                   | 59.28             | -13.89        | 74             | -28.61      | 146                 | 120                  | Peak    |
| Antenna Polarity & Test Distance: Vertical at 3 m   |                         |                   |               |                |             |                     |                      |         |
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 2480                                                | 93.3                    | 98.15             | -4.85         |                |             | 233                 | 300                  | Average |
| 2480                                                | 95.34                   | 100.19            | -4.85         |                |             | 233                 | 300                  | Peak    |
| 2483.52                                             | 41.86                   | 46.71             | -4.85         | 54             | -12.14      | 233                 | 300                  | Average |
| 2483.52                                             | 50.23                   | 55.08             | -4.85         | 74             | -23.77      | 233                 | 300                  | Peak    |
| 4960                                                | 36.47                   | 50.36             | -13.89        | 54             | -17.53      | 135                 | 141                  | Average |
| 4960                                                | 45.31                   | 59.2              | -13.89        | 74             | -28.69      | 135                 | 141                  | Peak    |

Remarks:

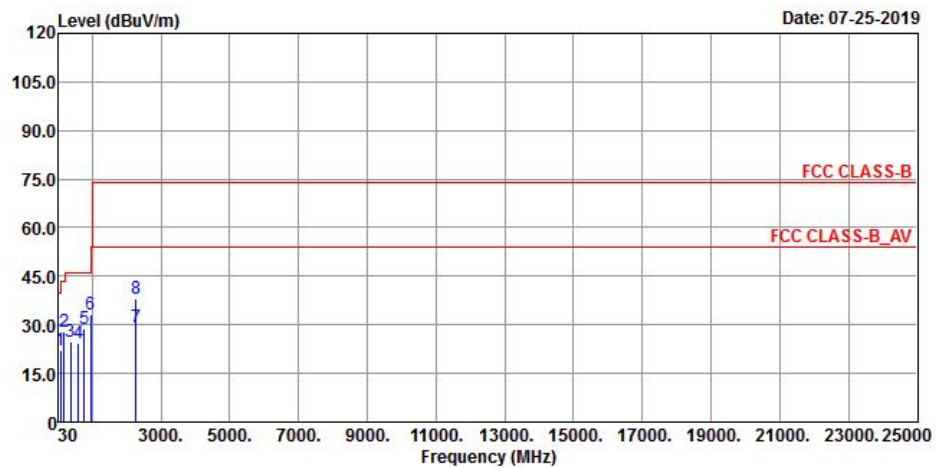
1. Emission Level = Read Level + Factor  
Margin Value = Emission Level – Limit value
2. 2480 MHz: Fundamental Frequency.
3. The other emission levels were very low against the limit.

#### 4.6.2 接收諧波

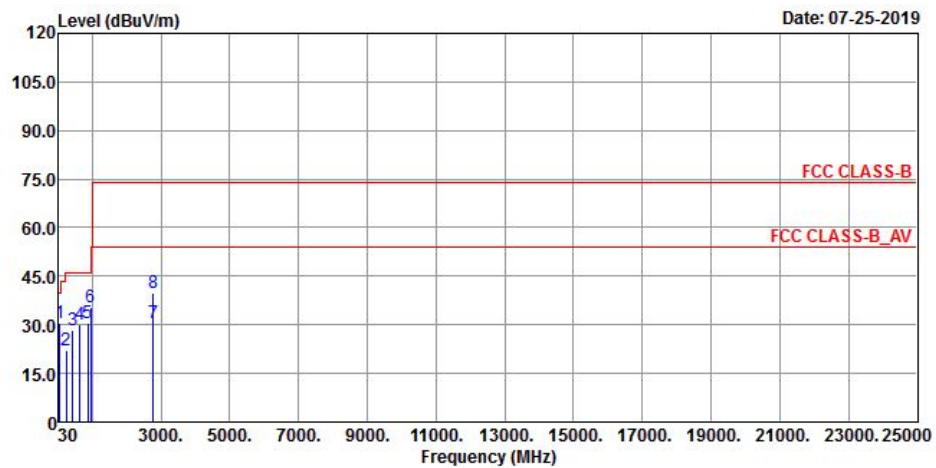
<LE 4.0>

| EUT Test Condition       |                    | Measurement Detail |                                                                                    |
|--------------------------|--------------------|--------------------|------------------------------------------------------------------------------------|
| Channel                  | Channel 39         | Frequency Range    | 30 MHz ~ 25 GHz                                                                    |
| Input Power              | 110 Vac, 60 Hz     | Detector Function  | Above 1 GHz: Peak (PK) & Average (AV)<br>Below 1 GHz: Peak (PK) or Quasi-Peak (QP) |
| Environmental Conditions | 25 deg. C, 65 % RH | Tested By          | Tim Chen                                                                           |

#### Horizontal



#### Vertical



| Antenna Polarity & Test Distance: Horizontal at 3 m |                         |                   |               |                |             |                     |                      |         |
|-----------------------------------------------------|-------------------------|-------------------|---------------|----------------|-------------|---------------------|----------------------|---------|
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 84.32                                               | 21.93                   | 43.95             | -22.02        | 40             | -18.07      | 184                 | 106                  | Peak    |
| 189.08                                              | 27.85                   | 47.2              | -19.35        | 43.5           | -15.65      | 202                 | 137                  | Peak    |
| 373.38                                              | 24.84                   | 39.92             | -15.08        | 46             | -21.16      | 199                 | 247                  | Peak    |
| 600.36                                              | 24.55                   | 32.84             | -8.29         | 46             | -21.45      | 182                 | 222                  | Peak    |
| 777.87                                              | 29                      | 33.51             | -4.51         | 46             | -17         | 197                 | 112                  | Peak    |
| 955.38                                              | 33.39                   | 36.47             | -3.08         | 46             | -12.61      | 192                 | 208                  | Peak    |
| 2265                                                | 29.1                    | 49.23             | -20.13        | 54             | -24.9       | 172                 | 84                   | Average |
| 2265                                                | 37.87                   | 58                | -20.13        | 74             | -36.13      | 172                 | 84                   | Peak    |
| Antenna Polarity & Test Distance: Vertical at 3 m   |                         |                   |               |                |             |                     |                      |         |
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 62.98                                               | 30.52                   | 48.93             | -18.41        | 40             | -9.48       | 113                 | 67                   | Peak    |
| 243.4                                               | 22.34                   | 40.26             | -17.92        | 46             | -23.66      | 108                 | 207                  | Peak    |
| 425.76                                              | 28.15                   | 40.63             | -12.48        | 46             | -17.85      | 144                 | 312                  | Peak    |
| 644.98                                              | 30.31                   | 38.66             | -8.35         | 46             | -15.69      | 109                 | 359                  | Peak    |
| 871.96                                              | 30.54                   | 34.89             | -4.35         | 46             | -15.46      | 104                 | 177                  | Peak    |
| 954.41                                              | 35.58                   | 38.63             | -3.05         | 46             | -10.42      | 102                 | 202                  | Peak    |
| 2780                                                | 30.77                   | 50.16             | -19.39        | 54             | -23.23      | 138                 | 231                  | Average |
| 2780                                                | 39.83                   | 59.22             | -19.39        | 74             | -34.17      | 138                 | 231                  | Peak    |

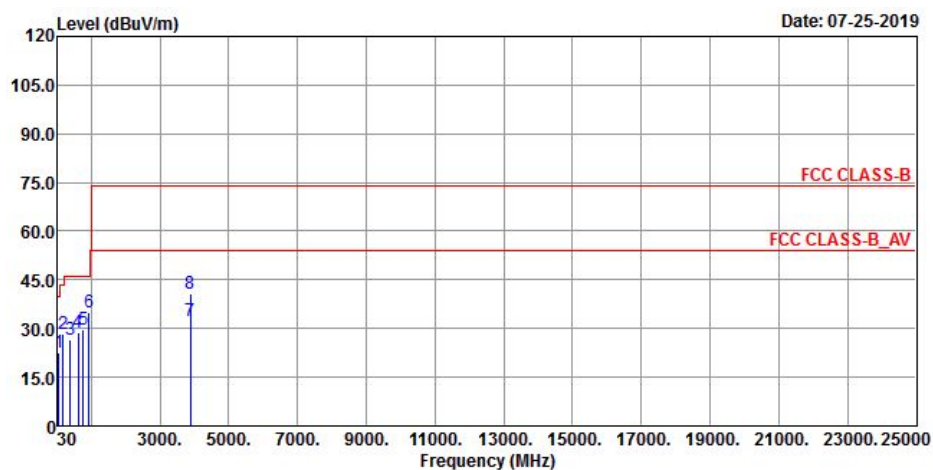
Remarks:

1. Emission Level = Read Level + Factor  
Margin Value = Emission Level – Limit value
2. The other emission levels were very low against the limit.

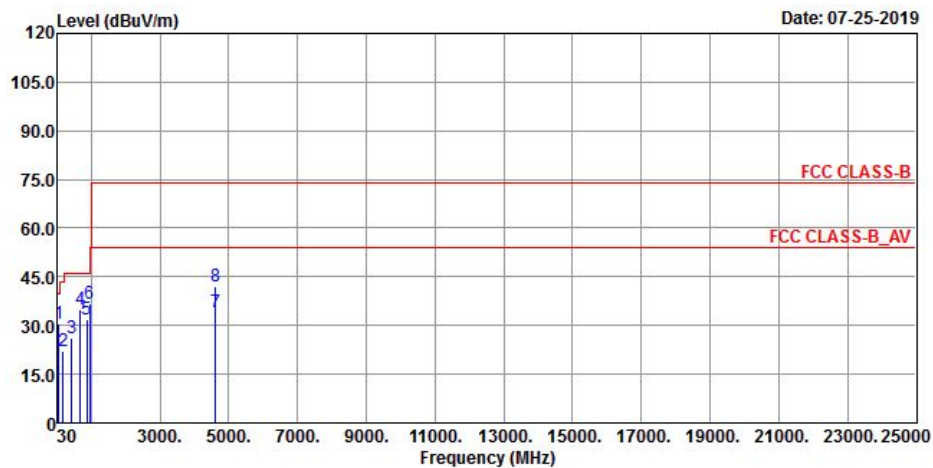
<LE 5.0>

| EUT Test Condition       |                    | Measurement Detail |                                                                                    |
|--------------------------|--------------------|--------------------|------------------------------------------------------------------------------------|
| Channel                  | Channel 39         | Frequency Range    | 30 MHz ~ 25 GHz                                                                    |
| Input Power              | 110 Vac, 60 Hz     | Detector Function  | Above 1 GHz: Peak (PK) & Average (AV)<br>Below 1 GHz: Peak (PK) or Quasi-Peak (QP) |
| Environmental Conditions | 25 deg. C, 65 % RH | Tested By          | Thomas Wei                                                                         |

### Horizontal



### Vertical



| Antenna Polarity & Test Distance: Horizontal at 3 m |                         |                   |               |                |             |                     |                      |         |
|-----------------------------------------------------|-------------------------|-------------------|---------------|----------------|-------------|---------------------|----------------------|---------|
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 66.86                                               | 22.73                   | 41.71             | -18.98        | 40             | -17.27      | 203                 | 82                   | Peak    |
| 181.32                                              | 28.3                    | 46.89             | -18.59        | 43.5           | -15.2       | 194                 | 116                  | Peak    |
| 400.54                                              | 26.78                   | 40.77             | -13.99        | 46             | -19.22      | 197                 | 67                   | Peak    |
| 621.7                                               | 28.94                   | 37.37             | -8.43         | 46             | -17.06      | 173                 | 355                  | Peak    |
| 776.9                                               | 29.62                   | 34.11             | -4.49         | 46             | -16.38      | 202                 | 116                  | Peak    |
| 941.8                                               | 35.04                   | 37.79             | -2.75         | 46             | -10.96      | 201                 | 53                   | Peak    |
| 3885                                                | 32.31                   | 49.59             | -17.28        | 54             | -21.69      | 152                 | 133                  | Average |
| 3885                                                | 40.89                   | 58.17             | -17.28        | 74             | -33.11      | 152                 | 133                  | Peak    |
| Antenna Polarity & Test Distance: Vertical at 3 m   |                         |                   |               |                |             |                     |                      |         |
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark  |
| 62.98                                               | 30.66                   | 49.07             | -18.41        | 40             | -9.34       | 103                 | 199                  | Peak    |
| 186.17                                              | 22.26                   | 41.36             | -19.1         | 43.5           | -21.24      | 115                 | 224                  | Peak    |
| 424.79                                              | 26.08                   | 38.6              | -12.52        | 46             | -19.92      | 139                 | 280                  | Peak    |
| 675.05                                              | 35.14                   | 42.27             | -7.13         | 46             | -10.86      | 144                 | 182                  | Peak    |
| 870.99                                              | 31.77                   | 36.1              | -4.33         | 46             | -14.23      | 133                 | 264                  | Peak    |
| 952.47                                              | 36.54                   | 39.51             | -2.97         | 46             | -9.46       | 185                 | 161                  | Peak    |
| 4625                                                | 33.98                   | 48.93             | -14.95        | 54             | -20.02      | 148                 | 195                  | Average |
| 4625                                                | 42.03                   | 56.98             | -14.95        | 74             | -31.97      | 148                 | 195                  | Peak    |

Remarks:

1. Emission Level = Read Level + Factor  
Margin Value = Emission Level – Limit value
2. The other emission levels were very low against the limit.

#### 4.6.3 其它不必要之訊號

##### 9 kHz ~ 30 MHz Data:

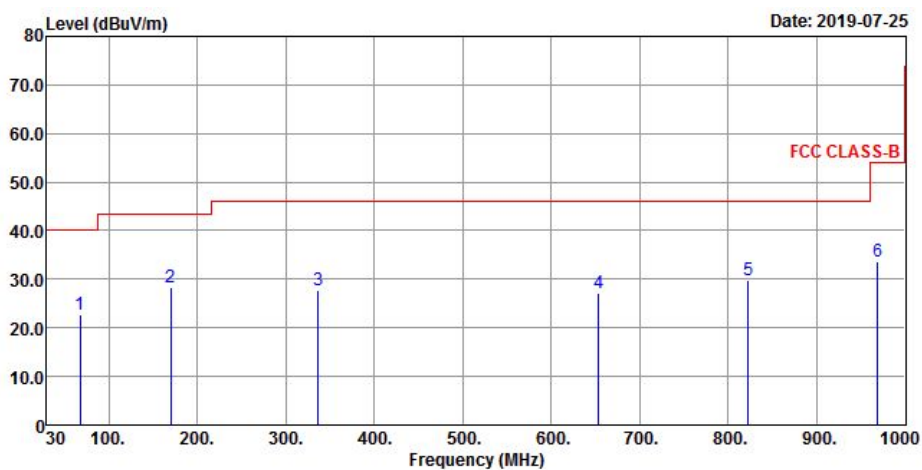
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

##### 30 MHz ~ 1 GHz Data:

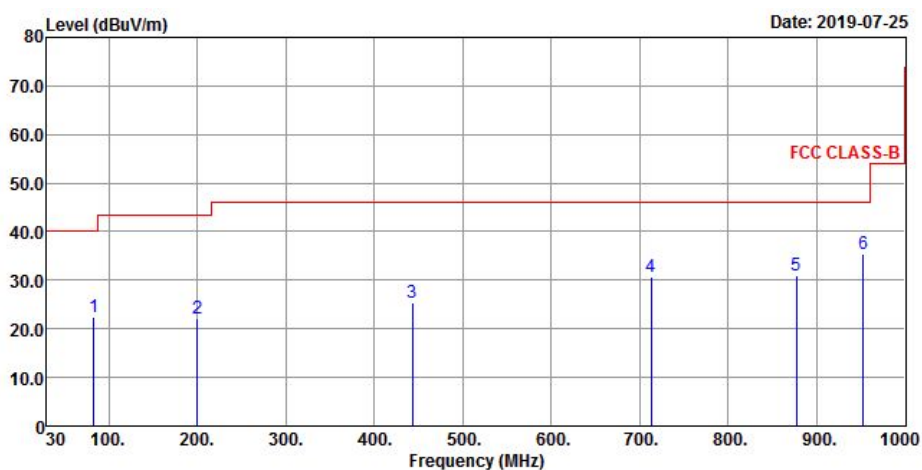
<LE 4.0>

| EUT Test Condition       |                    | Measurement Detail |                              |
|--------------------------|--------------------|--------------------|------------------------------|
| Channel                  | Channel 39         | Frequency Range    | 30 MHz ~ 1 GHz               |
| Input Power              | 110 Vac, 60 Hz     | Detector Function  | Peak (PK) or Quasi-Peak (QP) |
| Environmental Conditions | 25 deg. C, 65 % RH | Tested By          | Tim Chen                     |

#### Horizontal



#### Vertical



| Antenna Polarity & Test Distance: Horizontal at 3 m |                         |                   |               |                |             |                     |                      |        |
|-----------------------------------------------------|-------------------------|-------------------|---------------|----------------|-------------|---------------------|----------------------|--------|
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark |
| 67.83                                               | 22.59                   | 41.76             | -19.17        | 40             | -17.41      | 213                 | 192                  | Peak   |
| 169.68                                              | 28.4                    | 46.02             | -17.62        | 43.5           | -15.1       | 184                 | 226                  | Peak   |
| 336.52                                              | 27.76                   | 42.73             | -14.97        | 46             | -18.24      | 196                 | 318                  | Peak   |
| 653.71                                              | 27.19                   | 35.14             | -7.95         | 46             | -18.81      | 188                 | 225                  | Peak   |
| 822.49                                              | 29.95                   | 34.82             | -4.87         | 46             | -16.05      | 178                 | 293                  | Peak   |
| 968.96                                              | 33.8                    | 36.99             | -3.19         | 54             | -20.2       | 155                 | 226                  | Peak   |
| Antenna Polarity & Test Distance: Vertical at 3 m   |                         |                   |               |                |             |                     |                      |        |
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark |
| 83.35                                               | 22.52                   | 44.51             | -21.99        | 40             | -17.48      | 134                 | 207                  | Peak   |
| 199.75                                              | 22.05                   | 41.84             | -19.79        | 43.5           | -21.45      | 123                 | 118                  | Peak   |
| 443.22                                              | 25.51                   | 37.73             | -12.22        | 46             | -20.49      | 126                 | 93                   | Peak   |
| 712.88                                              | 30.77                   | 37.9              | -7.13         | 46             | -15.23      | 151                 | 108                  | Peak   |
| 876.81                                              | 30.98                   | 35.47             | -4.49         | 46             | -15.02      | 139                 | 189                  | Peak   |
| 952.47                                              | 35.53                   | 38.5              | -2.97         | 46             | -10.47      | 107                 | 144                  | Peak   |

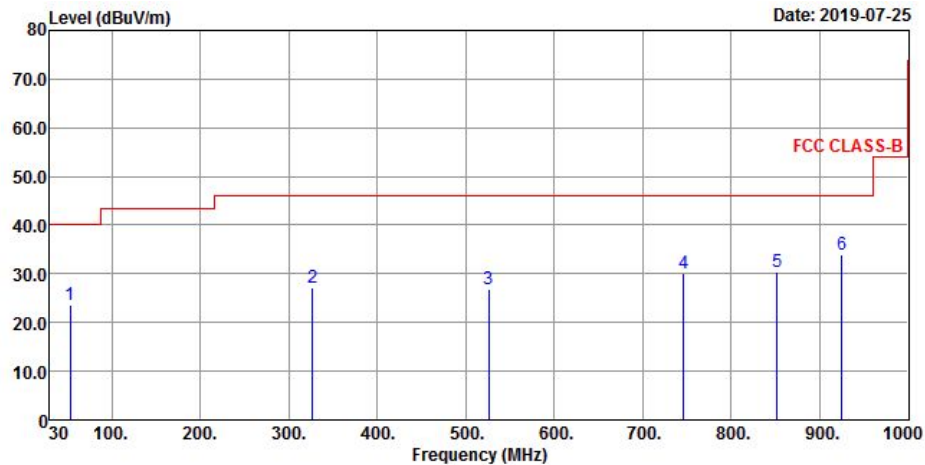
Remarks:

1. Emission Level = Read Level + Factor  
Margin Value = Emission Level – Limit value
2. The other emission levels were very low against the limit.

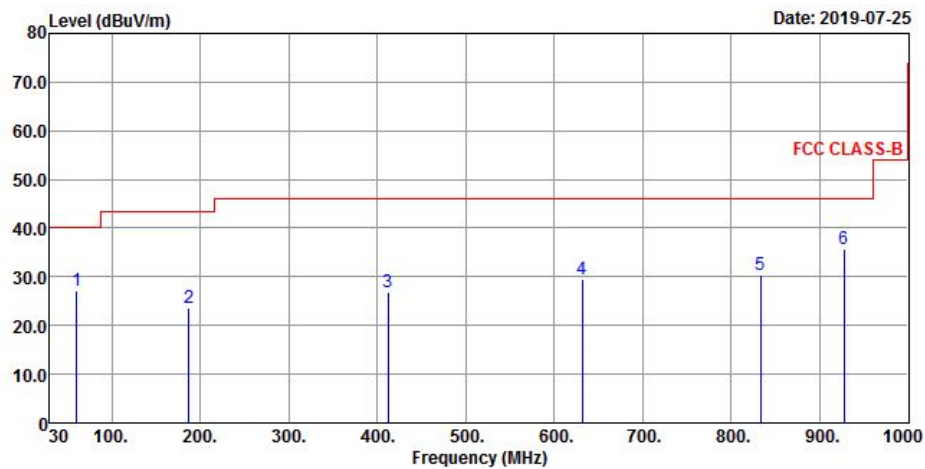
<LE 5.0>

| EUT Test Condition       |                    | Measurement Detail |                              |
|--------------------------|--------------------|--------------------|------------------------------|
| Channel                  | Channel 39         | Frequency Range    | 30 MHz ~ 1 GHz               |
| Input Power              | 110 Vac, 60 Hz     | Detector Function  | Peak (PK) or Quasi-Peak (QP) |
| Environmental Conditions | 25 deg. C, 65 % RH | Tested By          | Thomas Wei                   |

### Horizontal



### Vertical



| Antenna Polarity & Test Distance: Horizontal at 3 m |                         |                   |               |                |             |                     |                      |        |
|-----------------------------------------------------|-------------------------|-------------------|---------------|----------------|-------------|---------------------|----------------------|--------|
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark |
| 53.28                                               | 23.65                   | 41.26             | -17.61        | 40             | -16.35      | 241                 | 94                   | Peak   |
| 326.82                                              | 27.19                   | 42.51             | -15.32        | 46             | -18.81      | 172                 | 212                  | Peak   |
| 525.67                                              | 26.97                   | 36.91             | -9.94         | 46             | -19.03      | 184                 | 192                  | Peak   |
| 745.86                                              | 30.12                   | 35.44             | -5.32         | 46             | -15.88      | 199                 | 306                  | Peak   |
| 851.59                                              | 30.46                   | 34.61             | -4.15         | 46             | -15.54      | 179                 | 273                  | Peak   |
| 925.31                                              | 34.01                   | 37.1              | -3.09         | 46             | -11.99      | 182                 | 165                  | Peak   |
| Antenna Polarity & Test Distance: Vertical at 3 m   |                         |                   |               |                |             |                     |                      |        |
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark |
| 60.07                                               | 27.06                   | 45.19             | -18.13        | 40             | -12.94      | 111                 | 137                  | Peak   |
| 187.14                                              | 23.54                   | 42.65             | -19.11        | 43.5           | -19.96      | 108                 | 95                   | Peak   |
| 412.18                                              | 26.8                    | 40.07             | -13.27        | 46             | -19.2       | 134                 | 121                  | Peak   |
| 631.4                                               | 29.42                   | 38.05             | -8.63         | 46             | -16.58      | 167                 | 289                  | Peak   |
| 833.16                                              | 30.37                   | 34.82             | -4.45         | 46             | -15.63      | 147                 | 102                  | Peak   |
| 927.25                                              | 35.69                   | 38.68             | -2.99         | 46             | -10.31      | 101                 | 87                   | Peak   |

Remarks:

1. Emission Level = Read Level + Factor  
Margin Value = Emission Level – Limit value
2. The other emission levels were very low against the limit.

#### 4.7 量測結果判定

依據測試數據結果，符合低功率射頻電機技術規範之要求。

## 5 6 dB 頻寬之要求

### 5.1 適用標準

請見本報告 3.1 節第(5)項的規定。

### 5.2 量測方法

- 將待測物輸出經由衰減器接到頻譜分析儀上。
- 設定待測物處於連續發射狀態。
- 計算由最大輸出功率峰值減 6 dB 的最大頻率範圍。

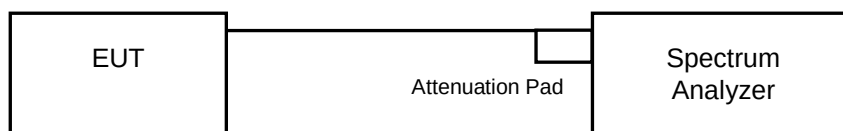
### 5.3 量測儀器

| Description & Manufacturer | Model No. | Serial No. | Date Of Calibration | Due Date Of Calibration |
|----------------------------|-----------|------------|---------------------|-------------------------|
| Spectrum Analyzer<br>R&S   | FSU43     | 101261     | Apr. 15, 2019       | Apr. 14, 2020           |

Note:

- The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
- The measurement uncertainty is 207 Hz, which is calculated as per the document ETSI TR 100 028. This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.

### 5.4 測試配置



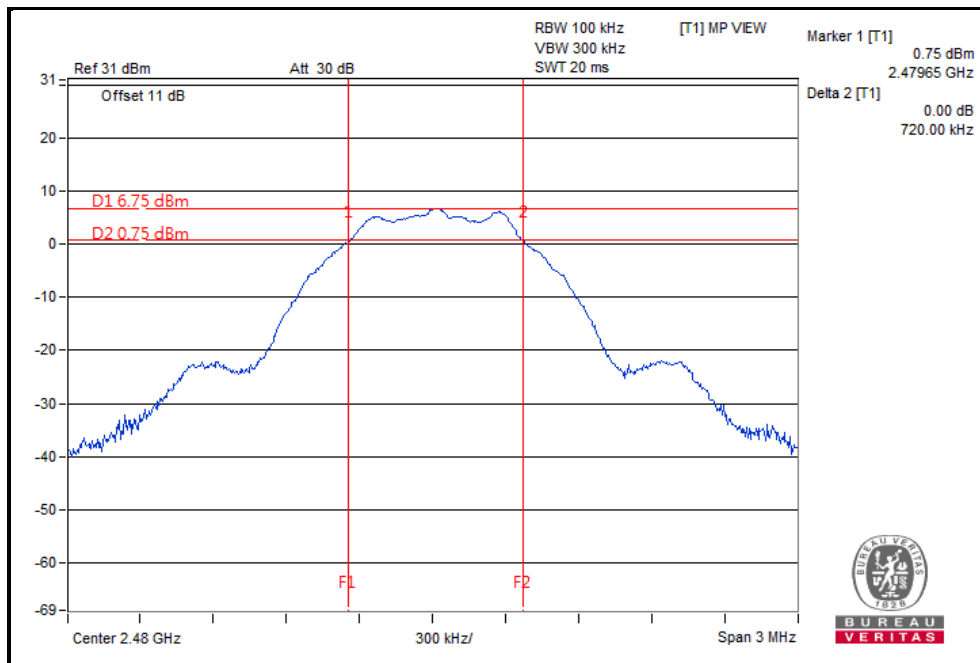
## 5.5 量測結果

<LE 4.0>

|        |          |        |                 |
|--------|----------|--------|-----------------|
| 操作模式   | 發射       | 測試日期   | 108 年 07 月 29 日 |
| 量測場地溫度 | 25 °C    | 量測場地濕度 | 60 % RH         |
| 測試者    | Gavin Wu |        |                 |

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) | Pass / Fail |
|---------|-----------------|----------------------|---------------------|-------------|
| 0       | 2402            | 0.71                 | 0.5                 | Pass        |
| 19      | 2440            | 0.70                 | 0.5                 | Pass        |
| 39      | 2480            | 0.72                 | 0.5                 | Pass        |

\*\*此測試圖僅放測試結果最差的頻道。

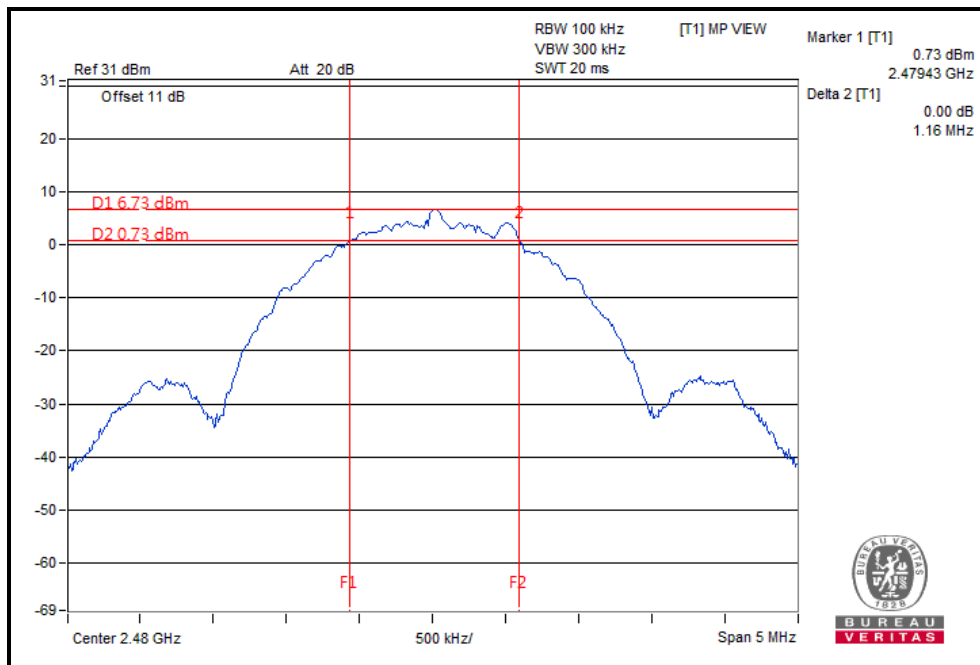


# <LE 5.0>

|        |          |        |                 |
|--------|----------|--------|-----------------|
| 操作模式   | 發射       | 測試日期   | 108 年 07 月 29 日 |
| 量測場地溫度 | 25 °C    | 量測場地濕度 | 60 % RH         |
| 測試者    | Gavin Wu |        |                 |

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) | Pass / Fail |
|---------|-----------------|----------------------|---------------------|-------------|
| 0       | 2402            | 1.13                 | 0.5                 | Pass        |
| 19      | 2440            | 1.12                 | 0.5                 | Pass        |
| 39      | 2480            | 1.16                 | 0.5                 | Pass        |

\*\*此測試圖僅放測試結果最差的頻道。



## 5.6 量測結果判定

依據測試數據結果，符合低功率射頻電機技術規範之要求。

## 6 峰值傳導輸出功率之量測

### 6.1 適用標準

請見本報告 3.1 節第(4)及(6)項的規定。

### 6.2 量測方法

- 將待測物輸出經由衰減器接到功率計上。
- 設定待測物處於連續發射狀態。
- 計算其輸出功率峰值。

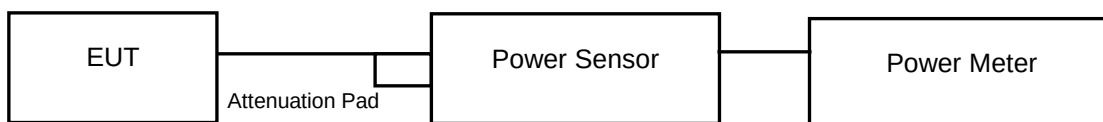
### 6.3 量測儀器

| Description & Manufacturer | Model No. | Serial No. | Date Of Calibration | Due Date Of Calibration |
|----------------------------|-----------|------------|---------------------|-------------------------|
| Power Meter<br>Anritsu     | ML2495A   | 1232002    | Dec. 17, 2018       | Dec. 16, 2019           |
| Power Sensor<br>Anritsu    | MA2411B   | 1207325    | Dec. 17, 2018       | Dec. 16, 2019           |

Note:

- The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
- The measurement uncertainty is 1.393 dB, which is calculated as per the document ETSI TR 100 028. This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of  $k=2$ .
- Measurement Bandwidth of ML2495A is 65 MHz greater than 6 dB bandwidth of emission.

### 6.4 測試配置



## 6.5 量測結果

### <LE 4.0>

|        |          |        |                 |
|--------|----------|--------|-----------------|
| 操作模式   | 發射       | 測試日期   | 108 年 07 月 29 日 |
| 量測場地溫度 | 25 °C    | 量測場地濕度 | 60 % RH         |
| 測試者    | Gavin Wu |        |                 |

| Channel | Frequency (MHz) | Peak Power (mW) | Peak Power (dBm) | Limit (dBm) | Pass / Fail |
|---------|-----------------|-----------------|------------------|-------------|-------------|
| 0       | 2402            | 5.957           | 7.75             | 30          | Pass        |
| 19      | 2440            | 5.794           | 7.63             | 30          | Pass        |
| 39      | 2480            | 5.598           | 7.48             | 30          | Pass        |

### <LE 5.0>

|        |          |        |                 |
|--------|----------|--------|-----------------|
| 操作模式   | 發射       | 測試日期   | 108 年 07 月 29 日 |
| 量測場地溫度 | 25 °C    | 量測場地濕度 | 60 % RH         |
| 測試者    | Gavin Wu |        |                 |

| Channel | Frequency (MHz) | Peak Power (mW) | Peak Power (dBm) | Limit (dBm) | Pass / Fail |
|---------|-----------------|-----------------|------------------|-------------|-------------|
| 0       | 2402            | 5.998           | 7.78             | 30          | Pass        |
| 19      | 2440            | 5.848           | 7.67             | 30          | Pass        |
| 39      | 2480            | 5.546           | 7.44             | 30          | Pass        |

## 6.6 量測結果判定

依據測試數據結果，符合低功率射頻電機技術規範之要求。

## 7 功率頻譜密度之量測

### 7.1 適用標準

請見本報告 3.1 節第(7)項的規定。

### 7.2 量測方法

- 將待測物之天線埠經由適當之衰減直接連至測試儀器。
- 設定解析頻寬為 3 kHz，視訊頻寬為 10 kHz，掃描時間為 auto。
- 掃描頻寬設於足夠觀察發射機所產生的主頻信號，並找到最大的峰值準位。
- 其峰值位準必須不大於 8 dBm。

### 7.3 量測儀器

| Description & Manufacturer | Model No. | Serial No. | Date Of Calibration | Due Date Of Calibration |
|----------------------------|-----------|------------|---------------------|-------------------------|
| Spectrum Analyzer<br>R&S   | FSU43     | 101261     | Apr. 15, 2019       | Apr. 14, 2020           |

Note:

- The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
- The measurement uncertainty is 207 Hz, which is calculated as per the document ETSI TR 100 028. This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.

### 7.4 測試配置



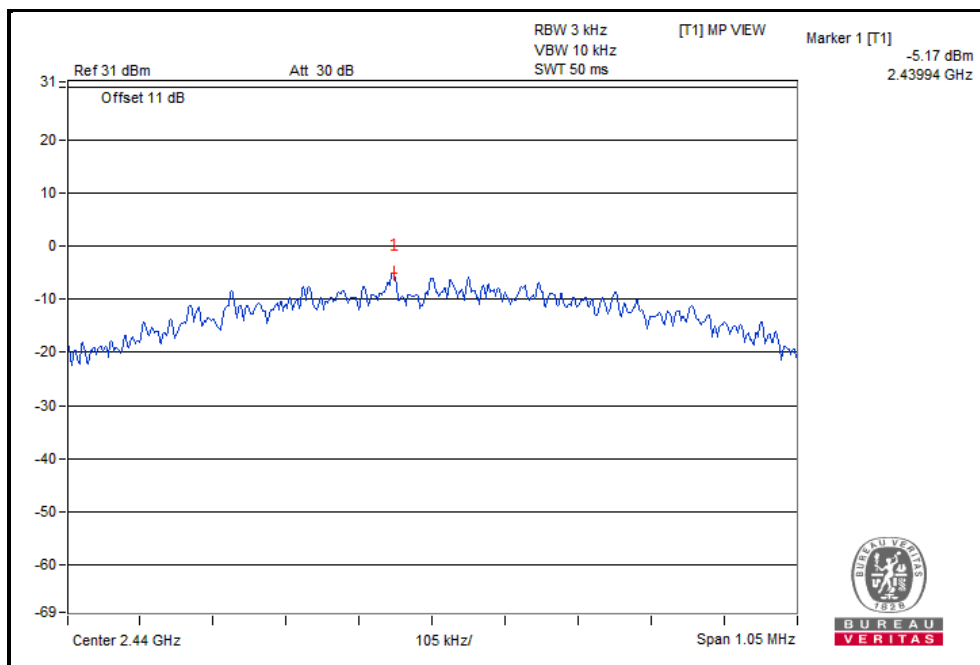
## 7.5 量測結果

<LE 4.0>

|        |          |        |                 |
|--------|----------|--------|-----------------|
| 操作模式   | 發射       | 測試日期   | 108 年 07 月 29 日 |
| 量測場地溫度 | 25 °C    | 量測場地濕度 | 60 % RH         |
| 測試者    | Gavin Wu |        |                 |

| Channel | Frequency (MHz) | PSD (dBm/3 kHz) | Limit (dBm/3 kHz) | Pass / Fail |
|---------|-----------------|-----------------|-------------------|-------------|
| 0       | 2402            | -5.90           | 8                 | Pass        |
| 19      | 2440            | -5.17           | 8                 | Pass        |
| 39      | 2480            | -5.97           | 8                 | Pass        |

\*\*此測試圖僅放測試結果最差的頻道。

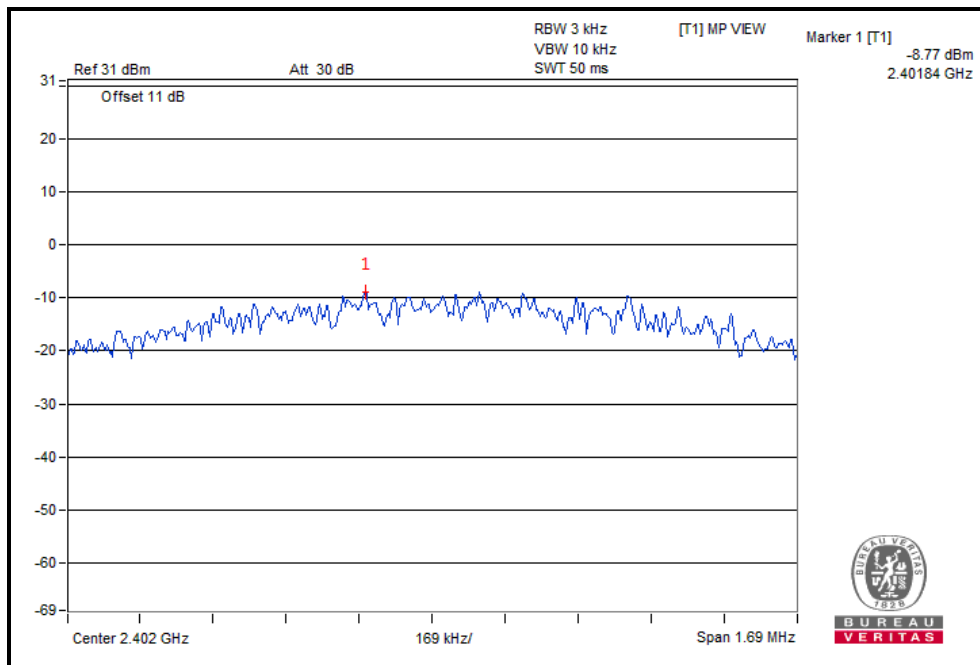


# <LE 5.0>

|        |          |        |                 |
|--------|----------|--------|-----------------|
| 操作模式   | 發射       | 測試日期   | 108 年 07 月 29 日 |
| 量測場地溫度 | 25 °C    | 量測場地濕度 | 60 % RH         |
| 測試者    | Gavin Wu |        |                 |

| Channel | Frequency (MHz) | PSD (dBm/3 kHz) | Limit (dBm/3 kHz) | Pass / Fail |
|---------|-----------------|-----------------|-------------------|-------------|
| 0       | 2402            | -8.77           | 8                 | Pass        |
| 19      | 2440            | -9.05           | 8                 | Pass        |
| 39      | 2480            | -9.50           | 8                 | Pass        |

\*\*此測試圖僅放測試結果最差的頻道。



## 7.6 量測結果判定

依據測試數據結果，符合低功率射頻電機技術規範之要求。

## NFC 頻段測試紀錄結果

### 8 不必要之發射量測

#### 8.1 適用標準

請見本報告 3.1 節第(11)項規定。

#### 8.2 量測方法

9 kHz ~ 30 MHz 量測：

在電波暗室，將待測物置於 0.8 米高的非金屬桌面，使其操作在工作狀態。接收天線置於 3 米距離。桌面要 360 度旋轉，另外接收天線分別置於 OPEN、CLOSE、GROUND-PARALLEL 極化各執行測試一次，以紀錄最大場強值。

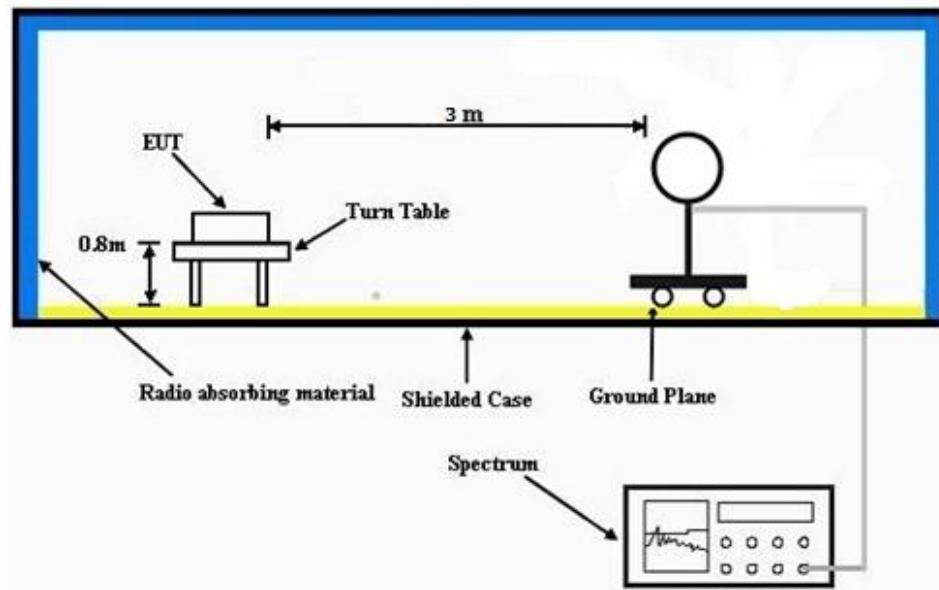
30 MHz ~ 1 GHz 量測：

在電波暗室，將待測物置於 0.8 米高的非金屬桌面，使其操作在工作狀態。接收天線置於 3 米距離。桌面要 360 度旋轉，另外接收天線從離地 1 米至 4 米升降變化，以找出最大的輻射電場強度，接收天線分別置於水平、垂直極化各執行測試一次。

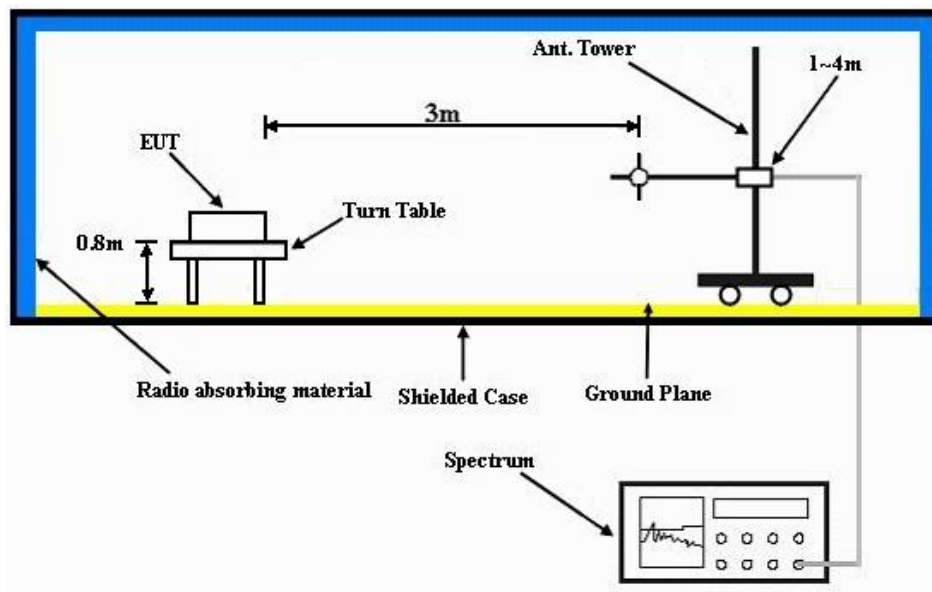
#### 8.3 量測儀器

同 4.3 節

## 8.4 測試配置



9 kHz ~ 30 MHz



30 MHz ~ 1 GHz

## 8.5 場強度之計算

場強之計算公式如下：

結果值 Emission level (dBuV/m) = 機器讀值 Raw Value (dBuV) + 校正因子 Correction Factor (dB/m)

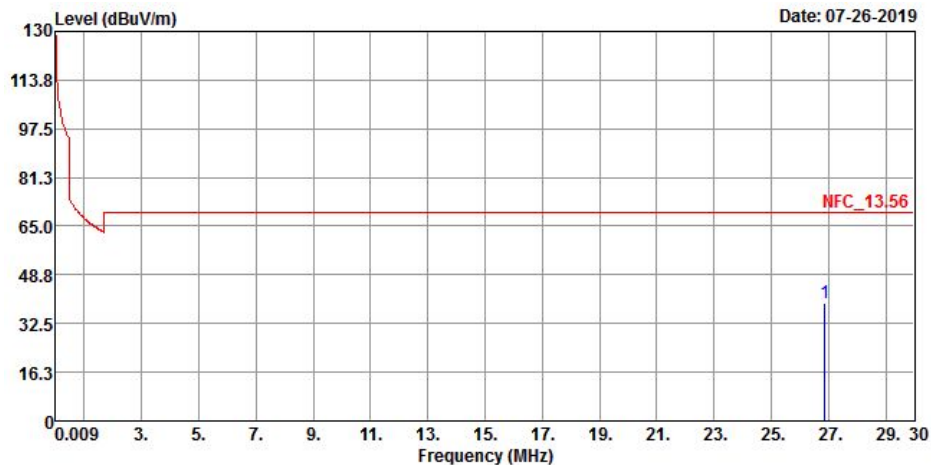
餘裕度 Margin(dB) = 結果值 Emission level (dBuV/m) - 限制值 Limit value (dBuV/m)

量測結果請見下頁。

## 8.6 量測結果

<Below 30 MHz>

| EUT Test Condition       |                    | Measurement Detail |                 |
|--------------------------|--------------------|--------------------|-----------------|
| Input Power              | 110 Vac, 60 Hz     | Operating Method   | Receiver        |
| Environmental Conditions | 25 deg. C, 65 % RH | Detector Function  | Quasi-Peak (QP) |
| Tested By                | Thomas Wei         |                    |                 |

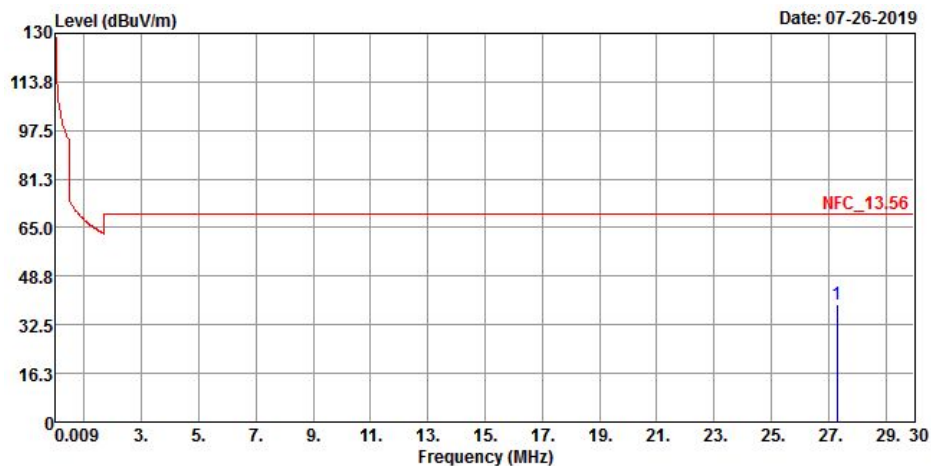


| Antenna Polarity & Test Distance: Loop Antenna Open at 3 m |                         |                   |               |                |             |                     |                      |        |
|------------------------------------------------------------|-------------------------|-------------------|---------------|----------------|-------------|---------------------|----------------------|--------|
| Frequency (MHz)                                            | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark |
| 26.881                                                     | 39.47                   | 17.37             | 22.1          | 69.54          | -30.07      | 100                 | 360                  | Peak   |

Note:

- Emission level (dBuV/m) = Read Level (dBuV) + Factor (dB/m)
- The other emission levels were very low against the limit.
- Margin value = Emission level - Limit value
- 當測試距離較規定距離為近時，測試結果應以插補係數換算至規定距離之值  
 $\text{Limit @ 3 m} = \text{Limit @ 300 m} + 40\log(300 / 3) = \text{Limit @ 300 m} + 80$   
 $\text{Limit @ 3 m} = \text{Limit @ 30 m} + 40\log(30 / 3) = \text{Limit @ 30 m} + 40$
- Open: loop antenna 面向 EUT  
 Close: loop antenna 與 EUT 垂直  
 Ground-parallel: loop antenna 與地面平行

| EUT Test Condition       |                    | Measurement Detail |                 |
|--------------------------|--------------------|--------------------|-----------------|
| Input Power              | 110 Vac, 60 Hz     | Operating Method   | Receiver        |
| Environmental Conditions | 25 deg. C, 65 % RH | Detector Function  | Quasi-Peak (QP) |
| Tested By                | Thomas Wei         |                    |                 |

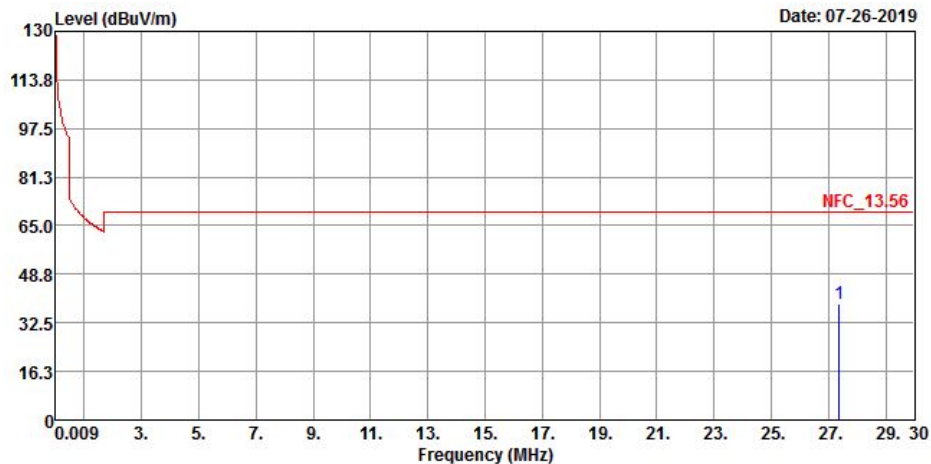


| Antenna Polarity & Test Distance: Loop Antenna Close at 3 m |                         |                   |               |                |             |                     |                      |        |
|-------------------------------------------------------------|-------------------------|-------------------|---------------|----------------|-------------|---------------------|----------------------|--------|
| Frequency (MHz)                                             | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark |
| 27.301                                                      | 39.17                   | 17.05             | 22.12         | 69.54          | -30.37      | 100                 | 0                    | Peak   |

Note:

- Emission level (dBuV/m) = Read Level (dBuV) + Factor (dB/m)
- The other emission levels were very low against the limit.
- Margin value = Emission level - Limit value
- 當測試距離較規定距離為近時，測試結果應以插補係數換算至規定距離之值  
 $\text{Limit @ 3 m} = \text{Limit @ 300 m} + 40\log(300 / 3) = \text{Limit @ 300 m} + 80$   
 $\text{Limit @ 3 m} = \text{Limit @ 30 m} + 40\log(30 / 3) = \text{Limit @ 30 m} + 40$
- Open: loop antenna 面向 EUT  
 Close: loop antenna 與 EUT 垂直  
 Ground-parallel: loop antenna 與地面平行

| EUT Test Condition       |                    | Measurement Detail |                 |
|--------------------------|--------------------|--------------------|-----------------|
| Input Power              | 110 Vac, 60 Hz     | Operating Method   | Receiver        |
| Environmental Conditions | 25 deg. C, 65 % RH | Detector Function  | Quasi-Peak (QP) |
| Tested By                | Thomas Wei         |                    |                 |



| Antenna Polarity & Test Distance: Loop Antenna Ground-parallel at 3 m |                         |                   |               |                |             |                     |                      |        |
|-----------------------------------------------------------------------|-------------------------|-------------------|---------------|----------------|-------------|---------------------|----------------------|--------|
| Frequency (MHz)                                                       | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark |
| 27.391                                                                | 38.72                   | 16.6              | 22.12         | 69.54          | -30.82      | 100                 | 360                  | Peak   |

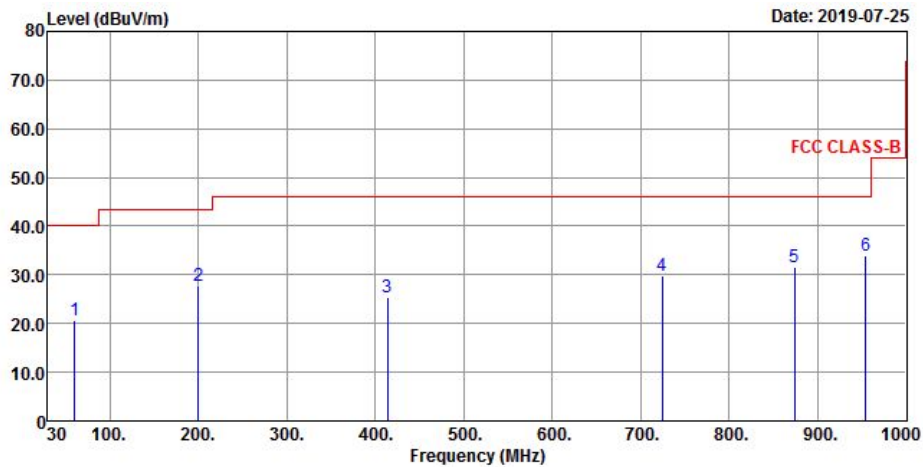
Note:

- Emission level (dBuV/m) = Read Level (dBuV) + Factor (dB/m)
- The other emission levels were very low against the limit.
- Margin value = Emission level - Limit value
- 當測試距離較規定距離為近時，測試結果應以插補係數換算至規定距離之值  
 $\text{Limit @ 3 m} = \text{Limit @ 300 m} + 40\log(300 / 3) = \text{Limit @ 300 m} + 80$   
 $\text{Limit @ 3 m} = \text{Limit @ 30 m} + 40\log(30 / 3) = \text{Limit @ 30 m} + 40$
- Open: loop antenna 面向 EUT  
 Close: loop antenna 與 EUT 垂直  
 Ground-parallel: loop antenna 與地面平行

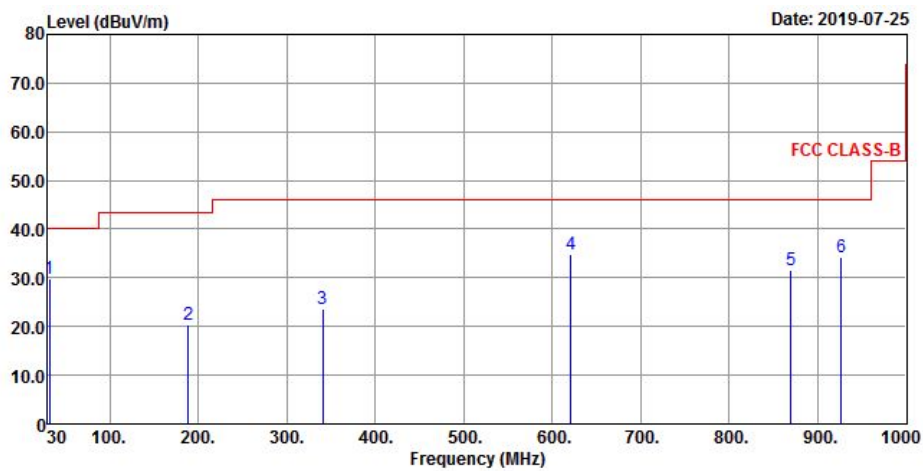
<Above 30 MHz>

| EUT Test Condition       |                    | Measurement Detail |                 |
|--------------------------|--------------------|--------------------|-----------------|
| Input Power              | 110 Vac, 60 Hz     | Operating Method   | Receiver        |
| Environmental Conditions | 25 deg. C, 65 % RH | Detector Function  | Quasi-Peak (QP) |
| Tested By                | Thomas Wei         |                    |                 |

Horizontal



Vertical



| Antenna Polarity & Test Distance: Horizontal at 3 m |                         |                   |               |                |             |                     |                      |        |
|-----------------------------------------------------|-------------------------|-------------------|---------------|----------------|-------------|---------------------|----------------------|--------|
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark |
| 60.07                                               | 20.8                    | 38.93             | -18.13        | 40             | -19.2       | 172                 | 193                  | Peak   |
| 199.75                                              | 27.69                   | 47.48             | -19.79        | 43.5           | -15.81      | 205                 | 33                   | Peak   |
| 414.12                                              | 25.48                   | 38.62             | -13.14        | 46             | -20.52      | 191                 | 258                  | Peak   |
| 724.52                                              | 29.7                    | 36.45             | -6.75         | 46             | -16.3       | 214                 | 116                  | Peak   |
| 873.9                                               | 31.48                   | 35.86             | -4.38         | 46             | -14.52      | 196                 | 149                  | Peak   |
| 954.41                                              | 33.8                    | 36.85             | -3.05         | 46             | -12.2       | 198                 | 314                  | Peak   |
| Antenna Polarity & Test Distance: Vertical at 3 m   |                         |                   |               |                |             |                     |                      |        |
| Frequency (MHz)                                     | Emission Level (dBuV/m) | Read Level (dBuV) | Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) | Remark |
| 31.94                                               | 29.71                   | 46.92             | -17.21        | 40             | -10.29      | 101                 | 81                   | Peak   |
| 189.08                                              | 20.37                   | 39.72             | -19.35        | 43.5           | -23.13      | 124                 | 318                  | Peak   |
| 340.4                                               | 23.5                    | 38.39             | -14.89        | 46             | -22.5       | 125                 | 76                   | Peak   |
| 620.73                                              | 34.78                   | 43.18             | -8.4          | 46             | -11.22      | 101                 | 174                  | Peak   |
| 870.02                                              | 31.64                   | 35.95             | -4.31         | 46             | -14.36      | 100                 | 63                   | Peak   |
| 926.28                                              | 34.13                   | 37.16             | -3.03         | 46             | -11.87      | 102                 | 158                  | Peak   |

Remarks:

1. Emission Level = Read Level + Factor  
Margin Value = Emission Level – Limit value
2. The other emission levels were very low against the limit.

## 8.7 量測結果判定

依據測試數據結果，符合低功率射頻電機技術規範之要求。

## **9 天線之要求**

### **9.1 適用標準**

請見本報告 3.1 節第(13)項的規定。

### **9.2 天線規格**

此待測物使用 Loop 天線，無使用天線接頭。

### **9.3 結果判定**

符合低功率射頻電機技術規範之要求。

## 10 電源線傳導干擾之量測

### 10.1 適用標準

請見本報告 3.1 節第(1)項的規定。

### 10.2 量測方法

將待測物置於 0.8 米高的非金屬桌面，使其操作在工作狀態，待測物電源線接至電源線阻抗穩定網路上，從測試接收機記錄頻率由 0.15 MHz 至 30 MHz 之間之電源線傳導放射強度。

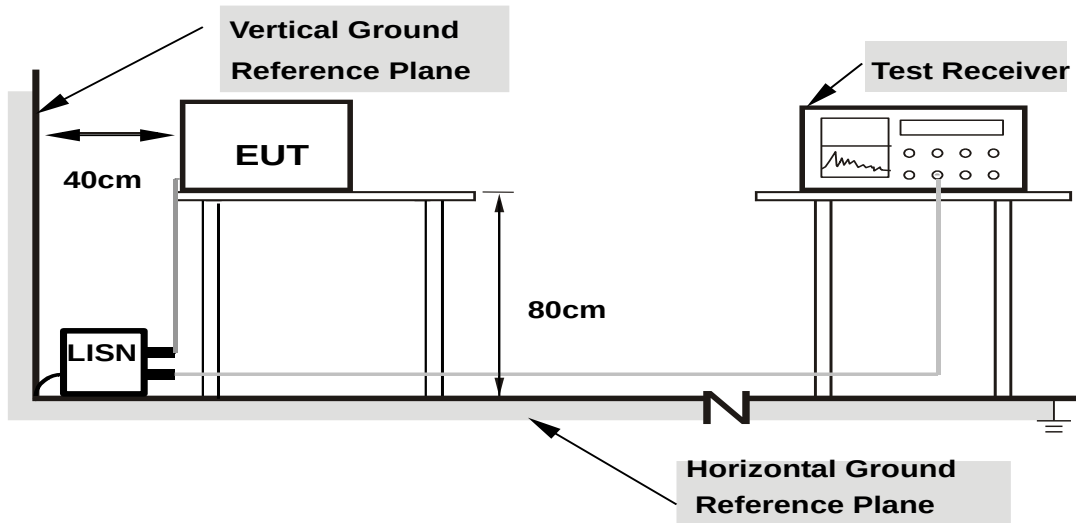
### 10.3 量測儀器

| Description & Manufacturer                  | Model No.                | Serial No.     | Date Of Calibration | Due Date Of Calibration |
|---------------------------------------------|--------------------------|----------------|---------------------|-------------------------|
| Test Receiver<br>ROHDE & SCHWARZ            | ESCI                     | 100613         | Dec. 10, 2018       | Dec. 09, 2019           |
| RF signal cable<br>Woken                    | 5D-FB                    | Cable-cond1-01 | Sep. 05, 2018       | Sep. 04, 2019           |
| LISN/AMN<br>ROHDE & SCHWARZ<br>(EUT)        | ENV216                   | 101826         | Feb. 21, 2019       | Feb. 20, 2020           |
| LISN/AMN<br>ROHDE & SCHWARZ<br>(Peripheral) | ESH3-Z5                  | 100311         | Aug. 19, 2018       | Aug. 18, 2019           |
| Software<br>ADT                             | BV ADT_Cond_<br>V7.3.7.4 | NA             | NA                  | NA                      |

#### NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Shielded Room 1.
3. The VCCI Site Registration No. is C-12040.
4. The measurement uncertainty is 2.94 dB, which is calculated as per the document CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.

#### 10.4 測試配置



**Note: 1.Support units were connected to second LISN.**

**2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

#### 10.5 干擾值之計算

餘裕度 Margin(dB)= 結果值 Emission level (dBuV)-限制值 Limit value (dBuV)

電源傳導干擾電壓之計算公式如下

結果值 Emission level (dBuV)=校正因子 Correction Factor (dB)+儀器讀值 Reading value (dBuV)

其中校正因子 Correction Factor (dB)為：

饋線損失+電源阻抗模擬網路損失

## 10.6 量測結果

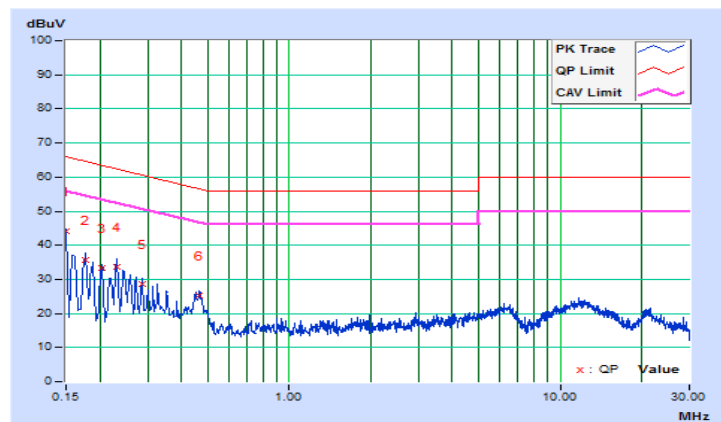
### LISN

|        |                |         |                              |
|--------|----------------|---------|------------------------------|
| 量測頻率範圍 | 150kHz ~ 30MHz | 檢測器與頻寬  | 準峰值 (QP) /<br>平均值 (AV), 9kHz |
| 量測電壓值  | 110Vac, 60Hz   | 量測場地溫濕度 | 25°C, 65%RH                  |
| 測試者    | Thomas Wei     | 測試日期    | 2019/7/26                    |
| 測試模式   | Mode 3         |         |                              |

| 量測電源端點：火線 (L1) |             |                  |                |       |               |       |               |       |            |        |
|----------------|-------------|------------------|----------------|-------|---------------|-------|---------------|-------|------------|--------|
| No             | 頻率<br>(MHz) | 修正<br>因子<br>(dB) | 量測讀值<br>(dBuV) |       | 干擾值<br>(dBuV) |       | 限制值<br>(dBuV) |       | 餘裕<br>(dB) |        |
|                |             |                  | 準峰值            | 平均值   | 準峰值           | 平均值   | 準峰值           | 平均值   | 準峰值        | 平均值    |
| 1              | 0.15000     | 9.84             | 34.24          | 17.28 | 44.08         | 27.12 | 66.00         | 56.00 | -21.92     | -28.88 |
| 2              | 0.17737     | 9.85             | 25.81          | 15.16 | 35.66         | 25.01 | 64.61         | 54.61 | -28.95     | -29.60 |
| 3              | 0.20458     | 9.85             | 23.46          | 11.53 | 33.31         | 21.38 | 63.42         | 53.42 | -30.11     | -32.04 |
| 4              | 0.23216     | 9.85             | 23.87          | 10.71 | 33.72         | 20.56 | 62.37         | 52.37 | -28.65     | -31.81 |
| 5              | 0.28685     | 9.86             | 18.90          | 11.71 | 28.76         | 21.57 | 60.62         | 50.62 | -31.86     | -29.05 |
| 6              | 0.46669     | 9.88             | 15.53          | 3.55  | 25.41         | 13.43 | 56.57         | 46.57 | -31.16     | -33.14 |

附註：

1. 其它頻率的干擾值對限制值而言非常低，所以未記錄。
2. 餘裕值(dB) = 干擾值(dBuV) - 限制值(dBuV)
3. 干擾值(dBuV) = 修正因子(dB) + 量測讀值(dBuV)

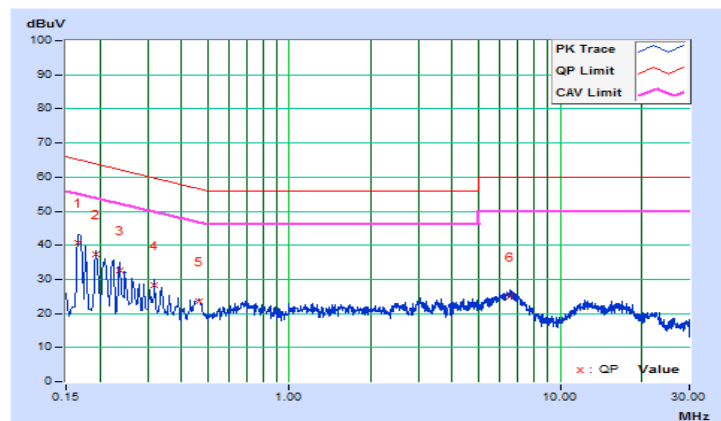


|        |                |         |                              |
|--------|----------------|---------|------------------------------|
| 量測頻率範圍 | 150kHz ~ 30MHz | 檢測器與頻寬  | 準峰值 (QP) /<br>平均值 (AV), 9kHz |
| 量測電壓值  | 110Vac, 60Hz   | 量測場地溫濕度 | 25°C, 65%RH                  |
| 測試者    | Thomas Wei     | 測試日期    | 2019/7/26                    |
| 測試模式   | Mode 3         |         |                              |

| 量測電源端點：中性線 (N) |             |                  |                |       |               |       |               |       |            |        |
|----------------|-------------|------------------|----------------|-------|---------------|-------|---------------|-------|------------|--------|
| No             | 頻率<br>(MHz) | 修正<br>因子<br>(dB) | 量測讀值<br>(dBuV) |       | 干擾值<br>(dBuV) |       | 限制值<br>(dBuV) |       | 餘裕<br>(dB) |        |
|                |             |                  | 準峰值            | 平均值   | 準峰值           | 平均值   | 準峰值           | 平均值   | 準峰值        | 平均值    |
| 1              | 0.16569     | 9.83             | 30.85          | 18.39 | 40.68         | 28.22 | 65.17         | 55.17 | -24.49     | -26.95 |
| 2              | 0.19305     | 9.84             | 27.51          | 14.11 | 37.35         | 23.95 | 63.90         | 53.90 | -26.55     | -29.95 |
| 3              | 0.23602     | 9.85             | 22.92          | 11.57 | 32.77         | 21.42 | 62.24         | 52.24 | -29.47     | -30.82 |
| 4              | 0.31813     | 9.86             | 18.41          | 2.14  | 28.27         | 12.00 | 59.76         | 49.76 | -31.49     | -37.76 |
| 5              | 0.46301     | 9.87             | 13.67          | 1.42  | 23.54         | 11.29 | 56.64         | 46.64 | -33.10     | -35.35 |
| 6              | 6.51157     | 10.07            | 14.77          | 2.49  | 24.84         | 12.56 | 60.00         | 50.00 | -35.16     | -37.44 |

附註：

1. 其它頻率的干擾值對限制值而言非常低，所以未記錄。
2. 餘裕值(dB) = 干擾值(dBuV) - 限制值(dBuV)
3. 干擾值(dBuV) = 修正因子(dB) + 量測讀值(dBuV)



## 10.7 量測結果判定

依據測試數據結果，符合低功率射頻電機技術規範之要求。

## 11 電波暴露量之評估

### 11.1 適用標準

請見本報告 3.1 節第(8)項的規定。

### 11.2 評估方法

a) 以 6.5 節所測得的最大輸出功率值再加上待測物天線的增益值(Gain)帶入下面公式換算出待測物所輻射的功率密度。

b)  $P_d = (P_{out} * G) / (4 * \pi * r^2)$

where

$P_d$  = power density in  $mW/cm^2$

$P_{out}$  = output power to antenna in mW

$G$  = gain of antenna in linear scale

$\pi$  = 3.1416

$R$  = distance between observation point and center of the radiator in cm

### 11.3 評估結果

| Frequency Band (MHz) | Max Power (dBm) | Antenna Gain (dBi) | Distance (cm) | Power Density ( $mW/cm^2$ ) | Limit ( $mW/cm^2$ ) | Pass / Fail |
|----------------------|-----------------|--------------------|---------------|-----------------------------|---------------------|-------------|
| 2402-2480            | 7.78            | 3                  | 20            | 0.002                       | 1                   | Pass        |

## 12 待測物照片

請參照 BV CPS 報告編號：190702C08

### 13 檢測實驗室基本資料

立德國際商品試驗有限公司桃園分公司提供產業界最佳的檢測以及諮詢服務。  
本公司為 ISO/IEC 17025 認可實驗室。

如您有任何問題或建議，請與下列實驗室聯絡：

林口 EMC / RF 實驗室：

Tel: 886-2-26052180

Fax: 886-2-26051924

新竹 EMC / RF 及通訊實驗室：

Tel: 886-3-6668565

Fax: 886-3-6668323

華亞 EMC / RF / Safety 實驗室：

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

Web Site: [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

您也可以在我們的網站內找到各實驗室的地圖。

---END---