

低功率射頻器材技術規範測試報告

報告編號.	RT200713C01
申請者	台灣松下銷售股份有限公司
產品名稱	RFID card reader
型號	RI14A (Host: FZ-M1J)
製造廠商	Panasonic Corporation
商標或廠牌	Panasonic
該產品樣品試驗 依據之試驗標準	國家通訊傳播委員會低功率射頻器材技術規範 109 年 7 月 1 日修訂
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 109 年 07 月 29 日

報告簽署人簽章:



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報告發行紀錄

Issue No.	Description	Date Issued
RT200713C01	Original release	109 年 07 月 29 日

證 明 書

發行日期：109 年 07 月 29 日

產 品 名 稱：RFID card reader
商 標：Panasonic
型 號：RI14A
申 請 者：台灣松下銷售股份有限公司
量 測 規 範：低功率射頻器材技術規範 LP0002 (訂定日期：109 年 7 月 1 日)
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：RI14A)，收件日期 109 年 07 月 14 日，於 109 年 07 月 20 日至 109 年 07 月 21 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“低功率射頻器材技術規範”及“電信管制射頻器材審驗管理辦法”製作測試結果報告。

特 此 證 明 ！

報告製作者：



薛雯馨 / 專員

， 日 期：109 年 07 月 29 日

審 核 者：



邱碧民 / 高級專案工程師

， 日 期：109 年 07 月 29 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 低功率射頻器材量測記錄表

申請廠商：台灣松下銷售股份有限公司

製造廠商：Panasonic Corporation

申請廠商地址：新北市中和區建六路 57 號(1 樓)

產品名稱：RFID card reader

廠牌：Panasonic

型號：RI14A

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：低功率射頻器材技術規範 LP0002 (訂定日期：109 年 7 月 1 日)
ANSI C63.10-2013

NFC 頻段概要

項次	量測項目	規 範	量測結果判定
1	主波發射	低功率射頻器材技術規範 4.2.1.1 節	合格
2	不必要之發射	低功率射頻器材技術規範 3.6 節, 4.2.1.2 節	合格
3	電源線傳導干擾	低功率射頻器材技術規範 3.3 節	合格
4	天線之要求	低功率射頻器材技術規範 3.2 節	合格
5	頻率容許差度	低功率射頻器材技術規範 4.2.1.3 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：	RFID card reader	
型號：	RI14A	
額定電源：	16 Vdc (host equipment) 7.2Vdc (battery)	
調變方式：	NFC	ASK
傳輸速率：	NFC	Type A : 106kbps, 212kbps, 424kbps Type B : 106kbps, 212kbps, 424kbps
載波頻率：	NFC	13.56 MHz
頻道數：	NFC	1
發射功率 (電場強度)：	NFC	18.05 dBuV/m (於 30 公尺距離) (QP)
天線種類：	見註 1	
電源線類別：	N/A	
信號線類別：	N/A	
配件：	N/A	

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)
NFC	13.56	Loop	DFUP2360ZA	TAI JING ELECTRONIC TECHNOLOGY INC.	I-pex	-30

2. 上述天線的規格資訊由申請者聲明，實驗室不承擔任何責任。

3. 此待測設備搭配使用之配件請參閱產品照編號: 200713C01

4. 待測設備主要內裝元件及配件如下。

配件	廠牌	型號	規格
Adapter	Panasonic	CF-AA6413A M1	I/P: 100-240V, 50/60Hz, 1.6A-0.9A, O/P: 16V, 4.06A AC 3 Pin, 0.98m non-shielded DC Cable
Battery 1	Panasonic	FZ-VZSU95Q	7.2Vdc max, 49Wh. 6800mAh
Battery 2	Panasonic	FZ-VZSU94Q	7.2Vdc max, 22Wh. 3050mAh
Tablet Computer	Panasonic	FZ-M1J	N/A

5. NFC傳輸模式Type A 以此傳輸模式進行最終量測。

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。

	NFC
擺放方式	側放

此裝置各頻道的中心頻率如下：

NFC 頻段：

頻道	對應頻率 (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.
1	Terminal	N/A	N/A	N/A
2	耳機/麥克風	HTC	N/A	N/A
3	USB 2.0 FLASH	HP	v250W	09
4	NFC Card	N/A	N/A	C200716-005-002-001
5	Tablet Computer	Panasonic	FZ-M1J	9KTSC00006
6	Adapter	Panasonic	CF-AA6413A M1	N/A

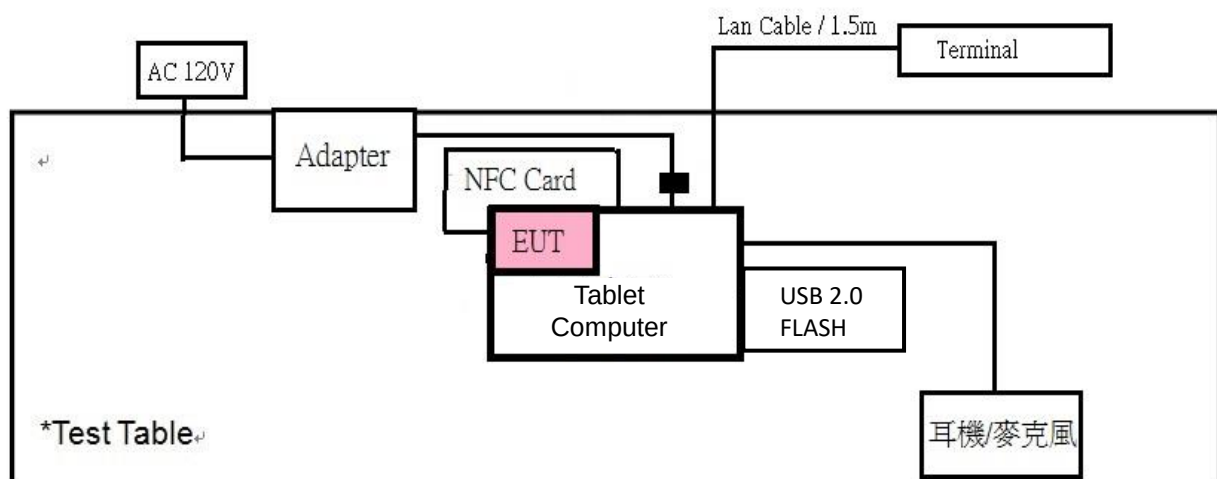
No.	Signal Cable Description Of The Above Support Units
1	Lan Cable 1.5m
2	N/A
3	N/A
4	N/A
5	N/A
6	0.98M with 1 core

NOTE:

1. All power cords of the above support units are non shielded (1.8m).
2. NO.5、NO.6 經申請者切結器材提供隨貨配件，NO.1、NO.2、NO.3、NO.4 配件由實驗室提供併一同檢驗。

2.3 測試架構圖

<NFC>



3 適用規範

3.1 規範要求和參考

► NFC 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器材技術規範之 3.3 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) 主波發射之規定

依據國家通訊傳播委員會低功率射頻器材技術規範 4.2.1.1 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。

(3) 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器材技術規範 4.2.1.2 節之要求，應符合第 2.8 節之規定：

頻率(MHz)	電場強度(微伏特/公尺, uV/m)	測距(公尺)
$0.009 \leq f \leq 0.490$	$2,400/f(\text{kHz})$	300
$0.490 < f \leq 1.705$	$24,000/f(\text{kHz})$	30
$1.705 < f < 30$	30	30
$30 \leq f \leq 88$	100	3
$88 < f \leq 216$	150	3
$216 < f \leq 960$	200	3
$960 < f$	500	3

(4) 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器材技術規範 4.2.1.3 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，應以新電池測試，須符合第 6.18 節之規定。

(5) 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 3.6 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	

NFC 頻段測試紀錄結果

4 主波發射之量測

4.1 適用標準

請見本報告 3.1 節第(2)項規定。

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，另外接收天線分別置於 Parallel、Perpendicular、Ground-parallel 極化各執行測試一次，以紀錄最大場強值。

Measurement Instrument Setting

The following table is the setting of receiver

Frequency Range	Setting
9 kHz ~ 150 kHz	Quasi-Peak: RBW = 200 Hz
150 kHz ~ 30 MHz	Quasi-Peak: RBW = 9 kHz or 10 kHz
30 MHz ~ 1000 MHz	Peak: RBW = 120 kHz; Quasi-Peak: RBW = 120 kHz

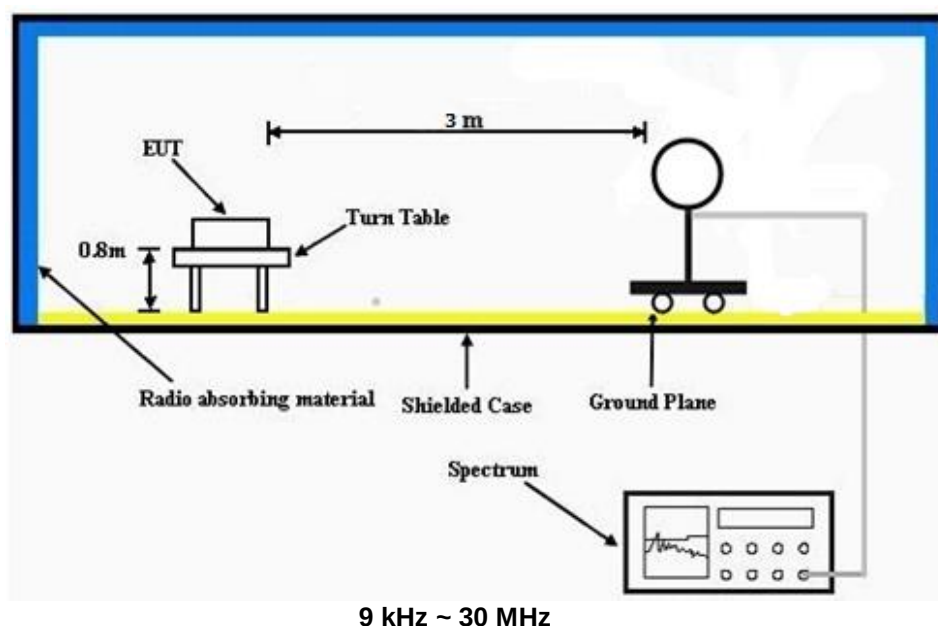
4.3 量測儀器

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver Agilent	N9038A	MY51210203	Mar. 18, 2020	Mar. 17, 2021
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 12, 2019	Dec. 11, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 16, 2020	Apr. 15, 2021
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 24, 2019	Nov. 23, 2020
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 08, 2019	Nov. 07, 2020
Fixed Attenuator WORKEN	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
Loop Antenna	EM-6879	269	Sep. 16, 2019	Sep. 15, 2020
Preamplifier EMCI	EMC001340	980201	Oct. 14, 2019	Oct. 13, 2020
Preamplifier EMCI	EMC 330H	980112	Oct. 08, 2019	Oct. 07, 2020
Power Meter Anritsu	ML2495A	1012010	Sep. 04, 2019	Sep. 03, 2020
Power Sensor Anritsu	MA2411B	1315050	Sep. 04, 2019	Sep. 03, 2020
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-8000&3000	140811+170717	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 08, 2019	Oct. 07, 2020
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	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 calibration interval of the loop antenna is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in HwaYa Chamber 10.
4. 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
Conducted emissions	9kHz~30MHz	2.44 dB
Radiated emissions	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

4.4 測試配置



4.5 場強度之計算

場強之計算公式如下：

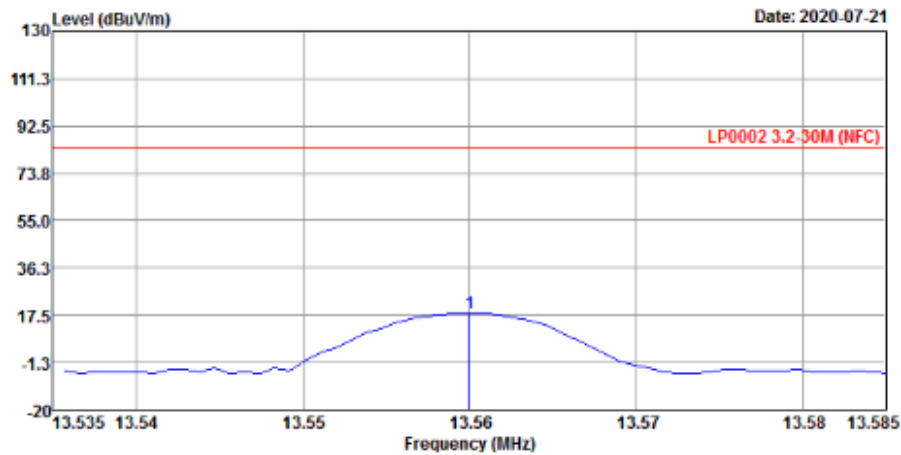
結果值 Emission level (dBuV/m)=機器讀值 Raw Value (dBuV) +校正因子 Correction Factor (dB/m)

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。

4.6 量測結果

EUT Test Condition		Measurement Detail	
Input Power	110 Vac, 60 Hz	Frequency Range	13.553 ~ 13.567 MHz
Environmental Conditions	25 deg. C, 65 % RH	Detector Function	Quasi-Peak (QP)
Tested By	Tim Chen		

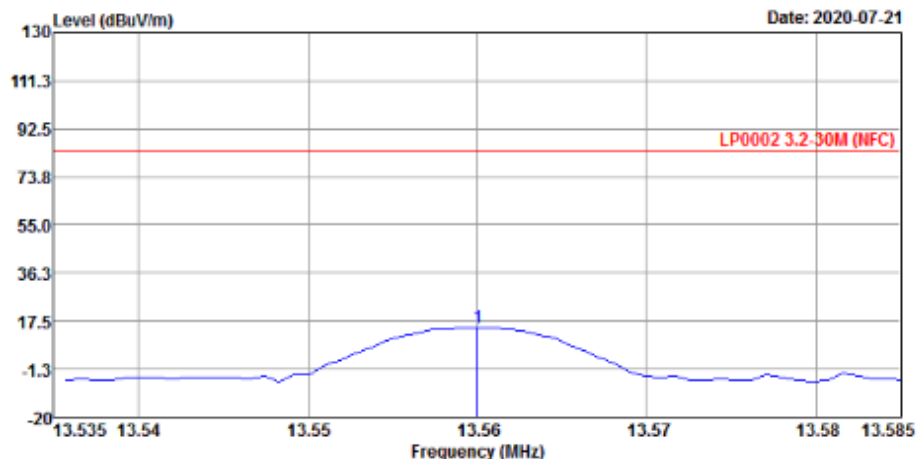


Antenna Polarity & Test Distance: Loop Antenna Parallel at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
13.56	18.05	36.68	-18.63	84	-65.95	100	0	QP

Note:

- Emission level (dBuV/m) = Read Level (dBuV) + Factor (dB/m)
- Factor = Antenna Gain + Cable loss + Distance conversion factor
- The other emission levels were very low against the limit.
- Margin value = Emission level - Limit value
- For 0.49 ~ 30MHz, the measured field strength was extrapolated to distance 30 meters Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$.
- Parallel: loop antenna 面向 EUT
Perpendicular: 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	Frequency Range	13.553 ~ 13.567 MHz
Environmental Conditions	25 deg. C, 65 % RH	Detector Function	Quasi-Peak (QP)
Tested By	Tim Chen		

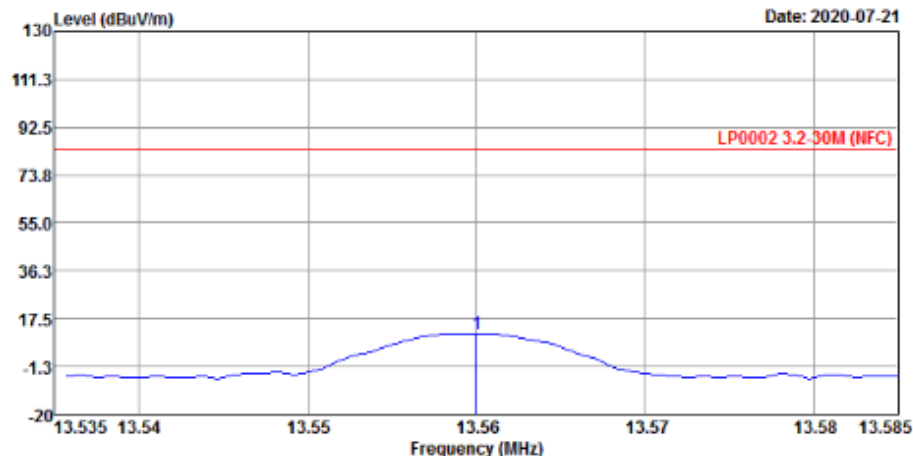


Antenna Polarity & Test Distance: Loop Antenna Perpendicular at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
13.56	14.93	33.56	-18.63	84	-69.07	100	360	QP

Note:

1. Emission level (dBuV/m) = Read Level (dBuV) + Factor (dB/m)
2. Factor = Antenna Gain + Cable loss + Distance conversion factor
3. The other emission levels were very low against the limit.
4. Margin value = Emission level - Limit value
5. For 0.49 ~ 30MHz, the measured field strength was extrapolated to distance 30 meters Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$.
6. Parallel: loop antenna 面向 EUT
Perpendicular: 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	Frequency Range	13.553 ~ 13.567 MHz
Environmental Conditions	25 deg. C, 65 % RH	Detector Function	Quasi-Peak (QP)
Tested By	Tim Chen		



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
13.56	11.71	30.34	-18.63	84	-72.29	100	0	QP

Note:

1. Emission level (dBuV/m) = Read Level (dBuV) + Factor (dB/m)
2. Factor = Antenna Gain + Cable loss + Distance conversion factor
3. The other emission levels were very low against the limit.
4. Margin value = Emission level - Limit value
5. For 0.49 ~ 30MHz, the measured field strength was extrapolated to distance 30 meters Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$.
6. Parallel: loop antenna 面向 EUT
Perpendicular: loop antenna 與 EUT 垂直
Ground-parallel: loop antenna 與地面平行

4.7 量測結果判定

依據測試數據結果，符合低功率射頻器材技術規範之要求。

5 不必要之發射量測

5.1 適用標準

請見本報告 3.1 節第 0 項規定。

5.2 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 Parallel、Perpendicular、Ground-parallel 極化各執行測試一次，以紀錄最大場強值。

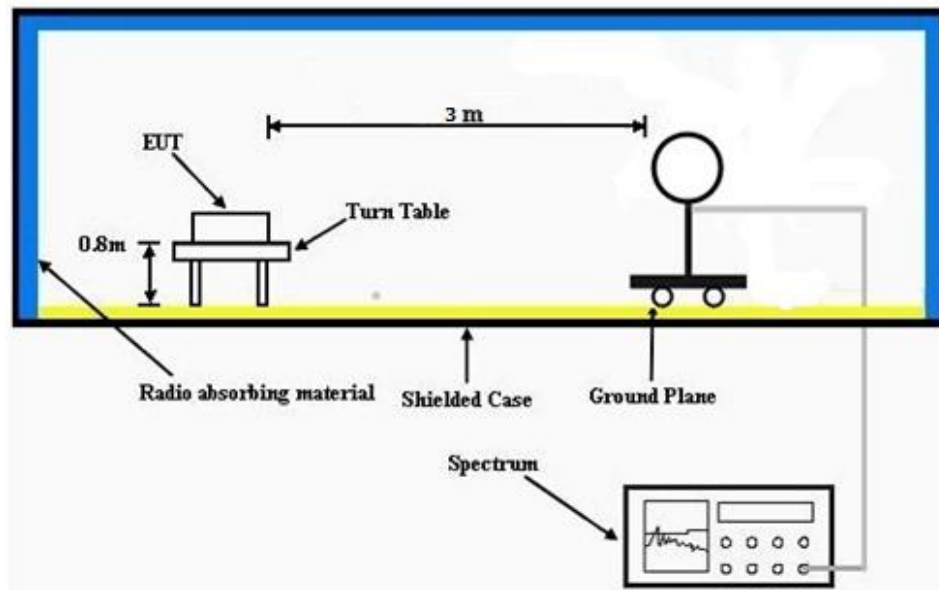
30 MHz ~ 1 GHz 量測：

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。

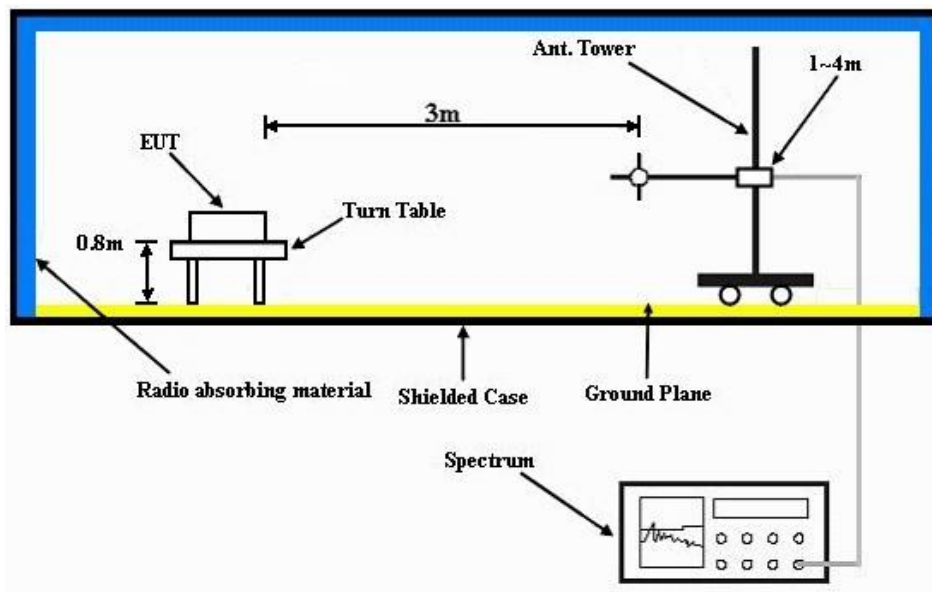
5.3 量測儀器

同 4.3 節

5.4 測試配置



9 kHz ~ 30 MHz



30 MHz ~ 1 GHz

5.5 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)

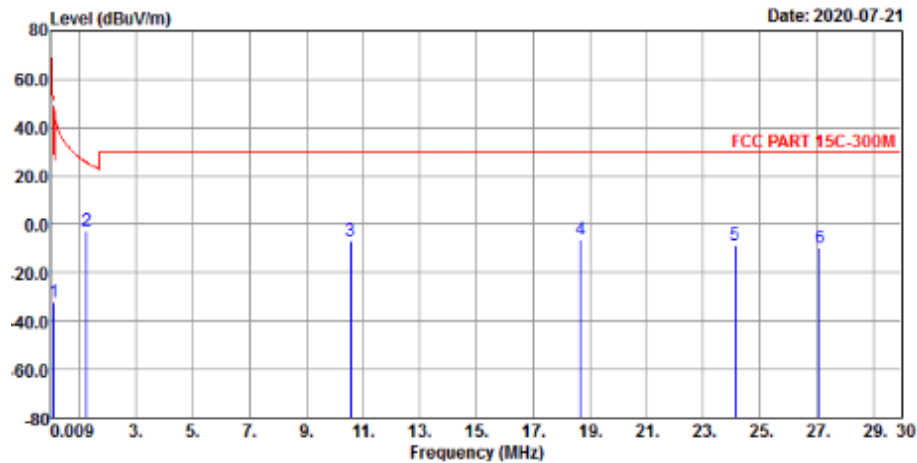
餘裕度 Margin(dB) = 結果值 Emission level (dBuV/m) - 限制值 Limit value (dBuV/m)

量測結果請見下頁。

5.6 量測結果

<Below 30 MHz>

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

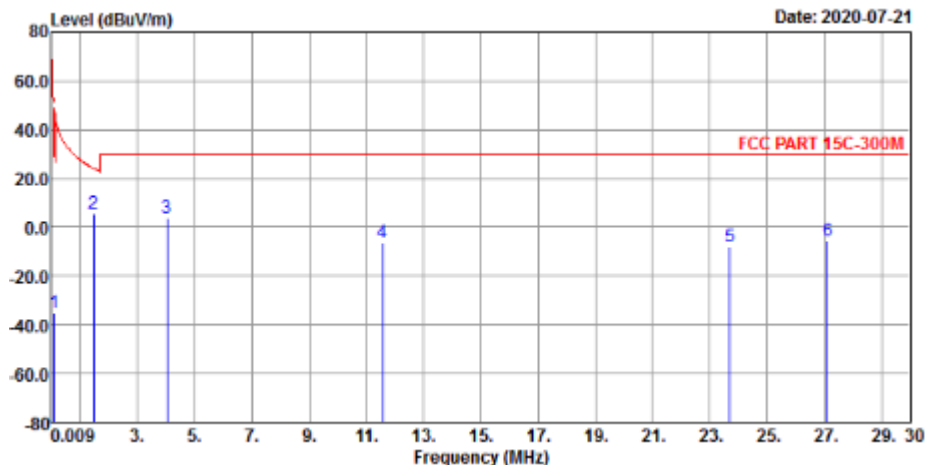


Antenna Polarity & Test Distance: Loop Antenna Parallel at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
0.0943	-32.3	28.32	-60.62	28.1	-60.4	100	153	QP
1.254	-2.75	17.55	-20.3	25.63	-28.38	100	103	QP
10.568	-6.56	12.21	-18.77	29.54	-36.1	100	83	QP
18.687	-6.11	12.33	-18.44	29.54	-35.65	100	216	QP
24.149	-8.66	9.65	-18.31	29.54	-38.2	100	288	QP
27.12	-9.46	8.79	-18.25	29.54	-39	100	354	QP

Note:

- Emission level (dBuV/m) = Read Level (dBuV) + Factor (dB/m)
- Factor = Antenna Gain + Cable loss + Distance conversion factor
- The other emission levels were very low against the limit.
- Margin value = Emission level - Limit value
- For 0.009 ~ 0.49MHz, the measured field strength was extrapolated to distance 300 meters Distance factor@3m = $40 \cdot \log(3/300) = -80\text{dB}$
For 0.49 ~ 30MHz, the measured field strength was extrapolated to distance 30 meters Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$
- Parallel: loop antenna 面向 EUT
Perpendicular: 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	Transmitter
Environmental Conditions	25 deg. C, 65 % RH	Detector Function	Quasi-Peak (QP)
Tested By	Tim Chen		

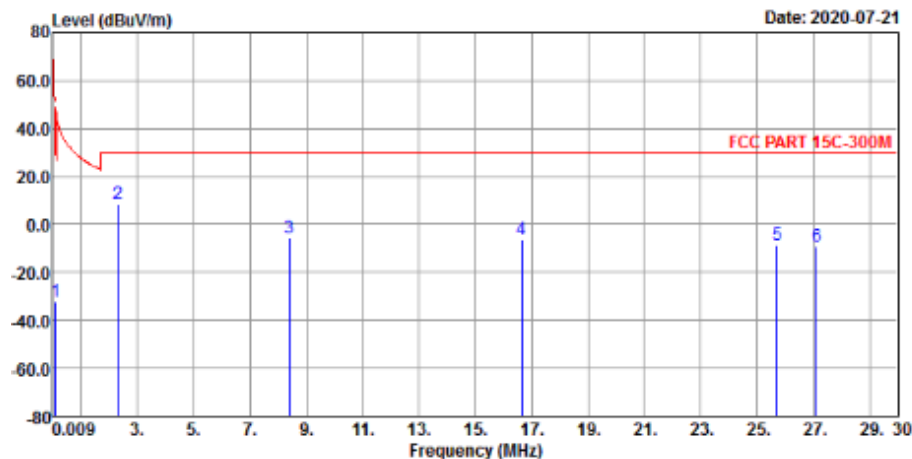


Antenna Polarity & Test Distance: Loop Antenna Perpendicular at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
0.10446	-34.85	25.83	-60.68	27.22	-62.07	100	115	QP
1.463	5.54	25.91	-20.37	24.29	-18.75	100	114	QP
4.031	3.76	23.99	-20.23	29.54	-25.78	100	168	QP
11.583	-6.29	12.43	-18.72	29.54	-35.83	100	54	QP
23.702	-8.03	10.29	-18.32	29.54	-37.57	100	193	QP
27.12	-5.58	12.67	-18.25	29.54	-35.12	100	205	QP

Note:

- Emission level (dBuV/m) = Read Level (dBuV) + Factor (dB/m)
- Factor = Antenna Gain + Cable loss + Distance conversion factor
- The other emission levels were very low against the limit.
- Margin value = Emission level - Limit value
- For 0.009 ~ 0.49MHz, the measured field strength was extrapolated to distance 300 meters Distance factor@3m = $40 \cdot \log(3/300) = -80\text{dB}$
For 0.49 ~ 30MHz, the measured field strength was extrapolated to distance 30 meters Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$
- Parallel: loop antenna 面向 EUT
Perpendicular: 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	Transmitter
Environmental Conditions	25 deg. C, 65 % RH	Detector Function	Quasi-Peak (QP)
Tested By	Tim Chen		

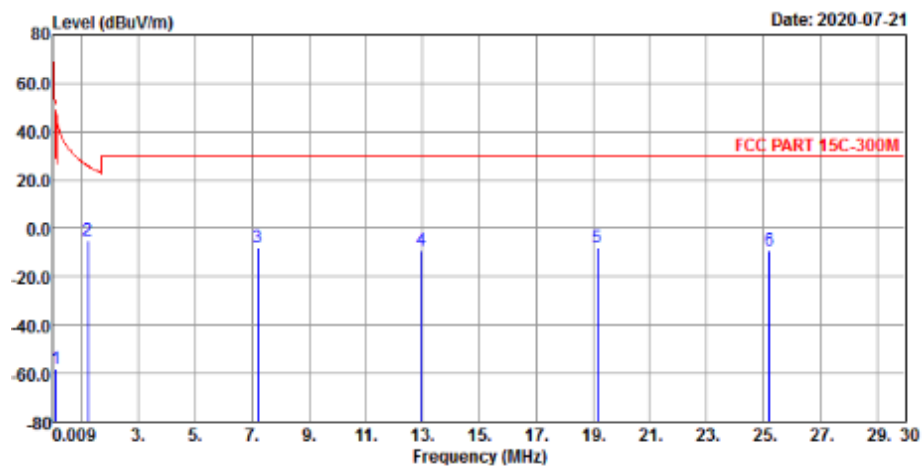


Antenna Polarity & Test Distance: Loop Antenna Ground-parallel at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
0.09233	-31.92	28.66	-60.58	28.29	-60.21	100	219	QP
2.329	8.45	29.04	-20.59	29.54	-21.09	100	207	QP
8.418	-5.72	13.36	-19.08	29.54	-35.26	100	136	QP
16.657	-6.09	12.42	-18.51	29.54	-35.63	100	24	QP
25.731	-8.27	10.01	-18.28	29.54	-37.81	100	309	QP
27.12	-8.92	9.33	-18.25	29.54	-38.46	100	250	QP

Note:

- Emission level (dBuV/m) = Read Level (dBuV) + Factor (dB/m)
- Factor = Antenna Gain + Cable loss + Distance conversion factor
- The other emission levels were very low against the limit.
- Margin value = Emission level - Limit value
- For 0.009 ~ 0.49MHz, the measured field strength was extrapolated to distance 300 meters Distance factor@3m = $40 \cdot \log(3/300) = -80\text{dB}$
For 0.49 ~ 30MHz, the measured field strength was extrapolated to distance 30 meters Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$
- Parallel: loop antenna 面向 EUT
Perpendicular: 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	Tim Chen		

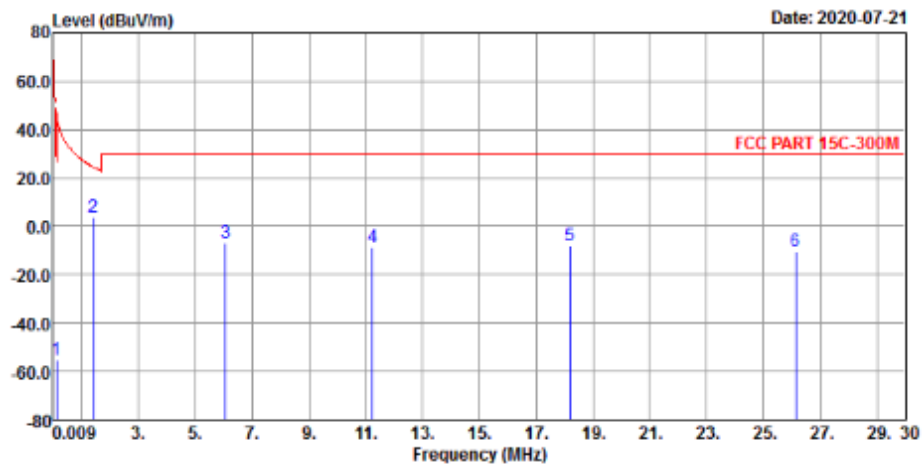


Antenna Polarity & Test Distance: Loop Antenna Parallel at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
0.09543	-57.95	2.68	-60.63	28	-85.95	100	156	QP
1.225	-4.73	15.56	-20.29	25.84	-30.57	100	257	QP
7.195	-8.07	11.25	-19.32	29.54	-37.61	100	183	QP
12.956	-9.34	9.31	-18.65	29.54	-38.88	100	174	QP
19.164	-7.78	10.64	-18.42	29.54	-37.32	100	234	QP
25.224	-9.36	8.92	-18.28	29.54	-38.9	100	174	QP

Note:

- Emission level (dBuV/m) = Read Level (dBuV) + Factor (dB/m)
- Factor = Antenna Gain + Cable loss + Distance conversion factor
- The other emission levels were very low against the limit.
- Margin value = Emission level - Limit value
- For 0.009 ~ 0.49MHz, the measured field strength was extrapolated to distance 300 meters Distance factor@3m = $40 \cdot \log(3/300) = -80\text{dB}$
For 0.49 ~ 30MHz, the measured field strength was extrapolated to distance 30 meters Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$
- Parallel: loop antenna 面向 EUT
Perpendicular: 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	Tim Chen		

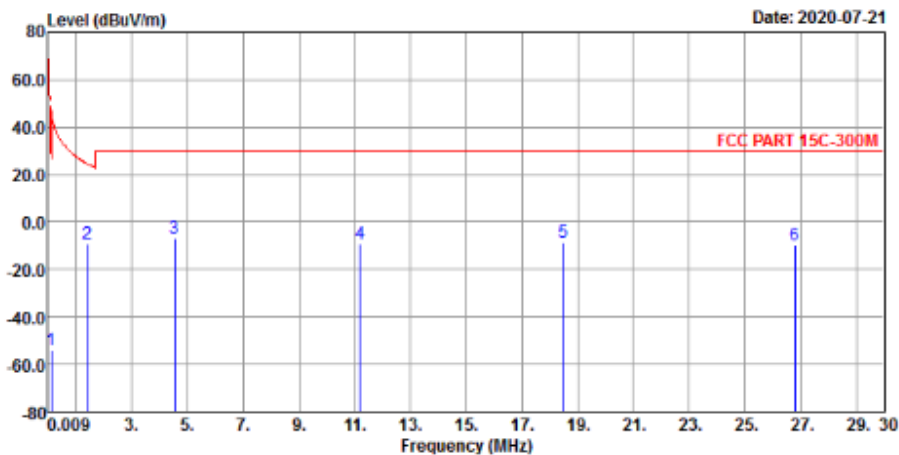


Antenna Polarity & Test Distance: Loop Antenna Perpendicular at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
0.10643	-55.23	5.44	-60.67	27.06	-82.29	100	251	QP
1.434	4.09	24.45	-20.36	24.47	-20.38	100	186	QP
6.06	-7.04	12.55	-19.59	29.54	-36.58	100	119	QP
11.254	-8.27	10.46	-18.73	29.54	-37.81	100	254	QP
18.209	-7.81	10.65	-18.46	29.54	-37.35	100	214	QP
26.149	-10.39	7.88	-18.27	29.54	-39.93	100	287	QP

Note:

- Emission level (dBuV/m) = Read Level (dBuV) + Factor (dB/m)
- Factor = Antenna Gain + Cable loss + Distance conversion factor
- The other emission levels were very low against the limit.
- Margin value = Emission level - Limit value
- For 0.009 ~ 0.49MHz, the measured field strength was extrapolated to distance 300 meters Distance factor@3m = $40 \cdot \log(3/300) = -80\text{dB}$
For 0.49 ~ 30MHz, the measured field strength was extrapolated to distance 30 meters Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$
- Parallel: loop antenna 面向 EUT
Perpendicular: 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	Tim Chen		



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
0.10728	-54.24	6.43	-60.67	26.99	-81.23	100	262	QP
1.434	-9.17	11.19	-20.36	24.47	-33.64	100	167	QP
4.538	-6.86	13.19	-20.05	29.54	-36.4	100	154	QP
11.195	-8.91	9.83	-18.74	29.54	-38.45	100	267	QP
18.478	-8.44	10.01	-18.45	29.54	-37.98	100	107	QP
26.806	-9.92	8.34	-18.26	29.54	-39.46	100	184	QP

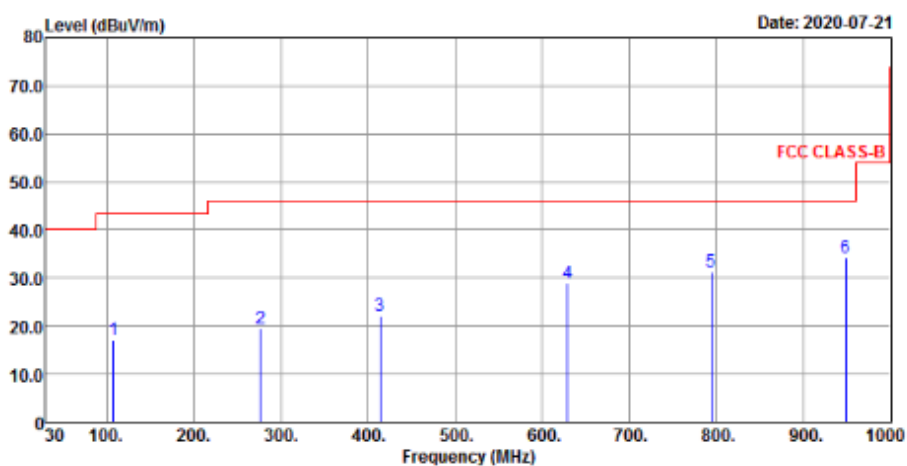
Note:

- Emission level (dBuV/m) = Read Level (dBuV) + Factor (dB/m)
- Factor = Antenna Gain + Cable loss + Distance conversion factor
- The other emission levels were very low against the limit.
- Margin value = Emission level - Limit value
- For 0.009 ~ 0.49MHz, the measured field strength was extrapolated to distance 300 meters Distance factor@3m = $40 \cdot \log(3/300) = -80\text{dB}$
For 0.49 ~ 30MHz, the measured field strength was extrapolated to distance 30 meters Distance factor@3m = $40 \cdot \log(3/30) = -40\text{dB}$
- Parallel: loop antenna 面向 EUT
Perpendicular: loop antenna與EUT垂直
Ground-parallel: loop antenna與地面平行

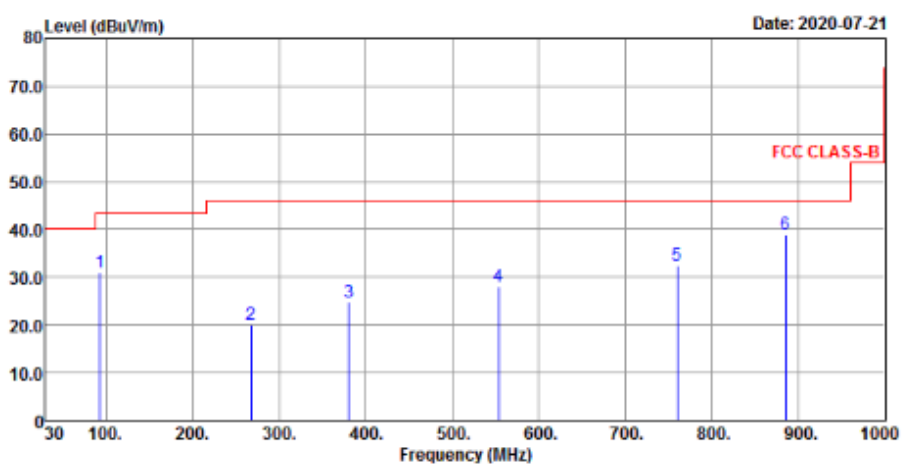
<Above 30 MHz>

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

Horizontal



Vertical



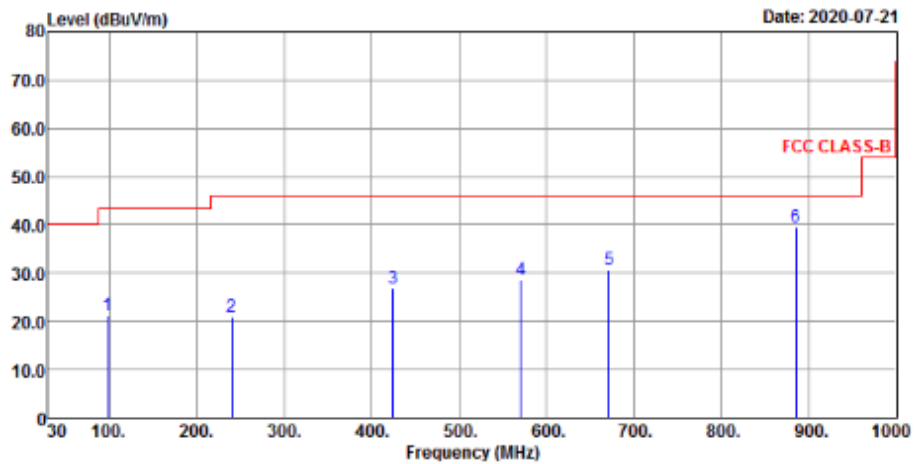
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
107.6	17.05	31.92	-14.87	43.5	-26.45	197	258	QP
276.38	19.57	31.43	-11.86	46	-26.43	274	301	QP
414.12	22.19	30.07	-7.88	46	-23.81	184	324	QP
629.46	28.87	30.67	-1.8	46	-17.13	247	231	QP
794.36	31.36	29.81	1.55	46	-14.64	176	154	QP
948.59	34.11	30.43	3.68	46	-11.89	184	237	QP
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
93.05	31.01	48.19	-17.18	43.5	-12.49	147	256	QP
267.65	20.2	32.45	-12.25	46	-25.8	243	123	QP
380.17	24.86	33.59	-8.73	46	-21.14	148	199	QP
553.8	28.15	32.49	-4.34	46	-17.85	174	103	QP
760.41	32.52	31.45	1.07	46	-13.48	284	140	QP
885.54	38.96	36.21	2.75	46	-7.04	170	247	QP

Remarks:

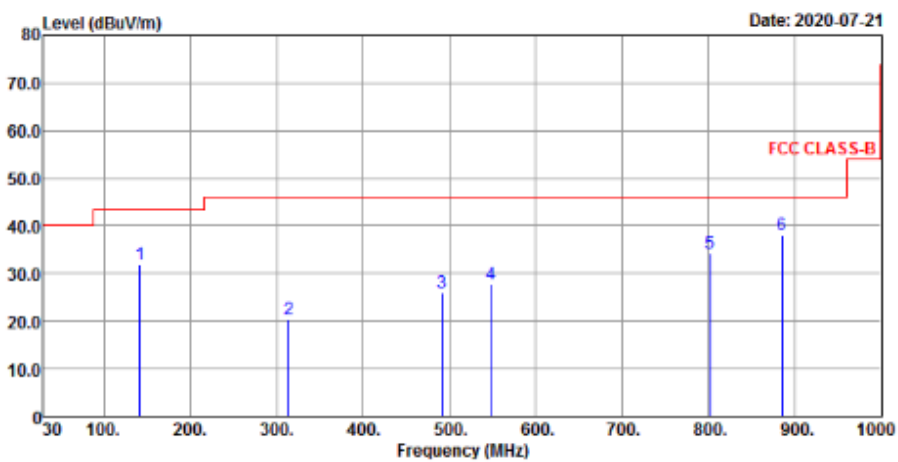
1. Emission Level = Read Level + Factor
Margin Value = Emission Level – Limit value
2. The other emission levels were very low against the limit.

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	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
98.87	21.2	37.42	-16.22	43.5	-22.3	224	167	QP
239.52	21.05	34.45	-13.4	46	-24.95	184	220	QP
424.79	26.77	34.07	-7.3	46	-19.23	197	156	QP
570.29	28.6	32.35	-3.75	46	-17.4	146	157	QP
671.17	30.69	31.96	-1.27	46	-15.31	158	274	QP
885.54	39.45	36.7	2.75	46	-6.55	190	247	QP
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
141.55	31.91	43.89	-11.98	43.5	-11.59	214	137	QP
314.21	20.49	31.12	-10.63	46	-25.51	187	192	QP
491.72	25.99	31.64	-5.65	46	-20.01	200	104	QP
548.95	27.74	32.23	-4.49	46	-18.26	284	159	QP
802.12	34.17	32.44	1.73	46	-11.83	170	211	QP
885.54	38.03	35.28	2.75	46	-7.97	236	148	QP

Remarks:

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

5.7 量測結果判定

依據測試數據結果，符合低功率射頻器材技術規範之要求。

6 電源線傳導干擾之量測

6.1 適用標準

請見本報告 3.1 節第 1 項的規定。

6.2 量測方法

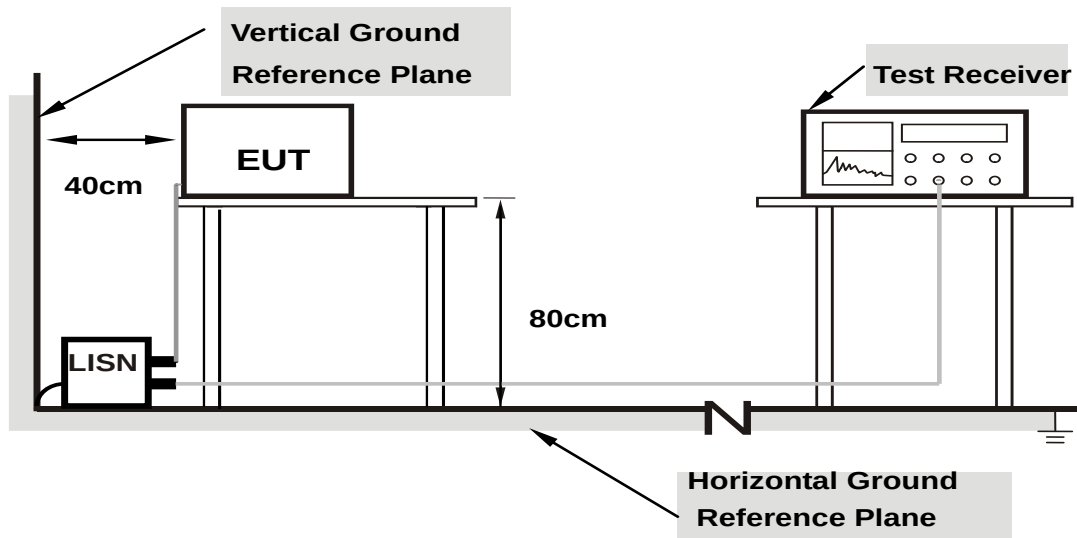
將待測物置於 0.8 米高的非金屬桌面，使其操作在工作狀態，待測物電源線接至電源線阻抗穩定網路上，從測試接收機記錄頻率由 0.15MHz 至 30MHz 之間之電源線傳導放射強度。

6.3 量測儀器

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESR3	102412	Feb. 17, 2020	Feb. 16, 2021
RF signal cable Woken	5D-FB	Cable-cond2-01	Sep. 05, 2019	Sep. 04, 2020
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Jan. 20, 2020	Jan. 19, 2021
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Aug. 13, 2019	Aug. 12, 2020
Software ADT	BV ADT_Cond_ 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 2.
 3. The VCCI Site Registration No. is C-12047.
 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.

6.4 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

6.5 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

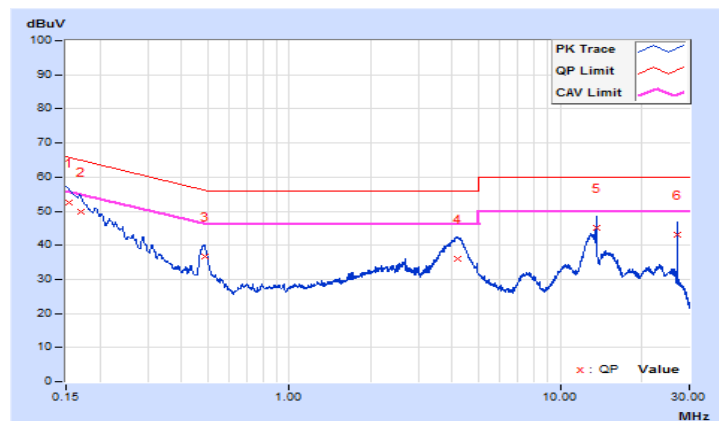
6.6 量測結果

Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110 Vac, 60 Hz	Environmental Conditions	25°C, 65%RH
Tested by	王紀維		

Phase Of Power : Line (L)										
No	Frequency	Correction Factor	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
	(MHz)	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15450	10.15	42.33	40.23	52.48	50.38	65.75	55.75	-13.27	-5.37
2	0.17025	10.16	39.72	30.09	49.88	40.25	64.95	54.95	-15.07	-14.70
3	0.48750	10.21	26.52	23.83	36.73	34.04	56.21	46.21	-19.48	-12.17
4	4.17075	10.39	25.64	22.55	36.03	32.94	56.00	46.00	-19.97	-13.06
5	13.56000	10.51	34.47	31.62	44.98	42.13	60.00	50.00	-15.02	-7.87
6	27.12075	10.43	32.77	30.64	43.20	41.07	60.00	50.00	-16.80	-8.93

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

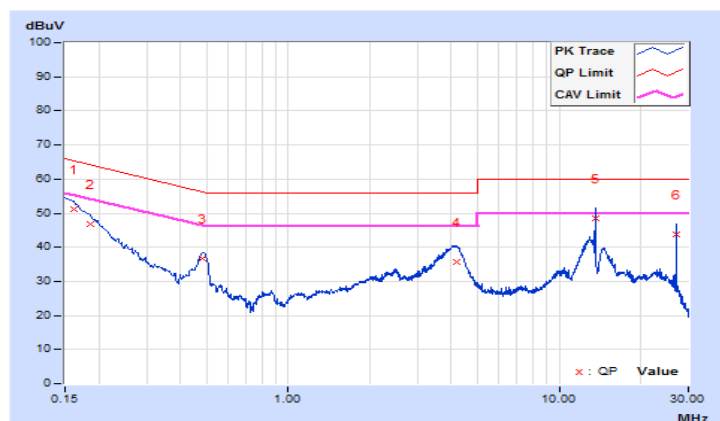


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110 Vac, 60 Hz	Environmental Conditions	25°C, 65%RH
Tested by	王紀維		

Phase Of Power : Neutral (N)										
No	Frequency	Correction Factor	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
	(MHz)	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16093	10.12	41.15	35.40	51.27	45.52	65.42	55.42	-14.15	-9.90
2	0.18600	10.13	36.55	30.26	46.68	40.39	64.21	54.21	-17.53	-13.82
3	0.48013	10.19	26.49	19.84	36.68	30.03	56.34	46.34	-19.66	-16.31
4	4.19550	10.40	25.22	20.17	35.62	30.57	56.00	46.00	-20.38	-15.43
5	13.56000	10.64	37.85	34.72	48.49	45.36	60.00	50.00	-11.51	-4.64
6	27.12075	10.59	33.11	30.89	43.70	41.48	60.00	50.00	-16.30	-8.52

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



7 天線之要求

7.1 適用標準

請見本報告 3.1 節第 0 項的規定。

7.2 天線規格

此待測物使用 Loop 天線，無使用天線接頭。

7.3 結果判定

符合低功率射頻電機技術規範之要求。

8 頻率容許差度之量測

8.1 適用標準

請見本報告 3.1 節第 0 項的規定。

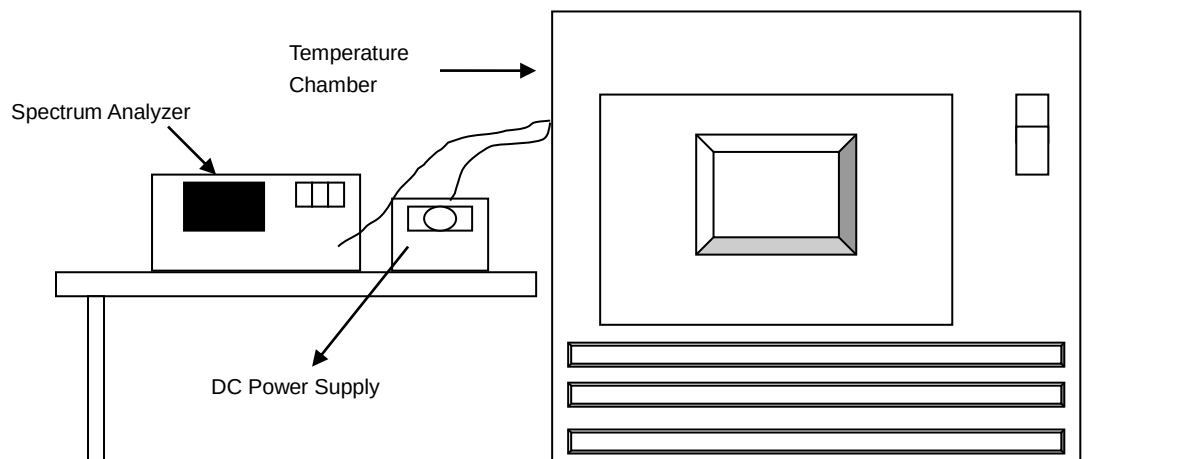
8.2 量測儀器

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Spectrum Analyzer R&S	FSU43	101261	Apr. 16, 2020	Apr. 15, 2021
Temperature & Humidity Chamber	GTH-120-40-C P-AR	MAA1306-019	Sep. 10, 2019	Sep. 09, 2020
Power Supply Anritsu	33010D	807748	NA	NA

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 $k=2$.

8.3 測試配置



8.4 量測結果

操作模式	發射	測試日期	109 年 07 月 21 日
量測場地溫度	23 °C	量測場地濕度	66 % RH
測試者	王紀維		

AFC Frequency Error vs. Temperature Limit : $\pm 0.01\%$									
Temp. (°C)	Power Supply (Vac)	0 minute		2 minute		5 minute		10 minute	
		Reading (MHz)	Drift (%)	Reading (MHz)	Drift (%)	Reading (MHz)	Drift (%)	Reading (MHz)	Drift (%)
50	110	13.55998	-0.00015	13.55998	-0.00015	13.55998	-0.00015	13.55997	-0.00022
40	110	13.55995	-0.00037	13.55995	-0.00037	13.55996	-0.00029	13.55995	-0.00037
30	110	13.56005	0.00037	13.56006	0.00044	13.56006	0.00044	13.56006	0.00044
20	110	13.56006	0.00044	13.56005	0.00037	13.56007	0.00052	13.56006	0.00044
10	110	13.55995	-0.00037	13.55996	-0.00029	13.55995	-0.00037	13.55995	-0.00037
0	110	13.56003	0.00022	13.56004	0.00029	13.56003	0.00022	13.56003	0.00022
-10	110	13.55998	-0.00015	13.55999	-0.00007	13.55999	-0.00007	13.55999	-0.00007
-20	110	13.56002	0.00015	13.56002	0.00015	13.56002	0.00015	13.56002	0.00015

AFC Frequency Error vs. Voltage Limit : $\pm 0.01\%$									
Temp. (°C)	Power Supply (Vac)	0 minute		2 minute		5 minute		10 minute	
		Reading (MHz)	Drift (%)	Reading (MHz)	Drift (%)	Reading (MHz)	Drift (%)	Reading (MHz)	Drift (%)
20	126.5	13.56006	0.00044	13.56005	0.00037	13.56007	0.00052	13.56006	0.00044
	110	13.56006	0.00044	13.56005	0.00037	13.56007	0.00052	13.56006	0.00044
	93.5	13.56006	0.00044	13.56005	0.00037	13.56007	0.00052	13.56006	0.00044

註 1：此待測物電源輸入使用 adapter 進行測試

註 2：此電壓為客戶宣告

8.5 量測結果判定

依據測試數據結果，符合低功率射頻器材技術規範之要求。

9 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

Web Site: www.bureauveritas-adt.com

您也可以在我們的網站內找到各實驗室的地圖。

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