

低功率射頻電機試驗報告

申請廠商	漢威聯合股份有限公司 新北市板橋區遠東路3號5樓
製造廠商	Honeywell International Inc.
產品名稱	資料收集電腦
廠牌	Honeywell
型號	VM1A-L0N
發射功率	請見本報告第1.1章節產品描述
工作頻率	請見本報告第1.1章節產品描述
調變方式	請見本報告第1.1章節產品描述
法規	LP0002: 5.20.2節

實驗室資訊

程智科技股份有限公司 五股實驗室

新北市五股區五工六路11號

認證有效期間：105年10月18日起至108年10月17日止

受理日期 民國108年04月30日

完成日期 民國108年08月26日

蔡永譚

報告簽署人
蔡永譚 簽章

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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
T190430W01-MD	Rev.00	Initial creation of document	All	May 17, 2019	Elle Chang
T190430W01-MD	Rev.01	Update information and add cradle information	Page 3, 7, 12, 13	Aug. 26, 2019	Elle Chang

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測試標準

國家通訊傳播委員會低功率射頻電機技術規範

民國 107 年 1 月 10 日版本

待測裝置已於程智科技股份有限公司 五股實驗室，依據國家通訊傳播委員會於中華民國一百零七年一月頒佈之低功率射頻電機技術規範測試。

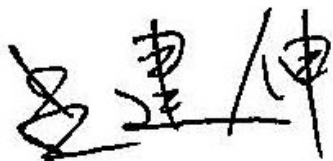
程智科技股份有限公司根據此條文規範項目測試，測試各項數據皆能符合此規範規定之限度值。

程智科技股份有限公司依低功率射頻電機技術規範審驗要點規範製作測試結果報告，測試結果評判為合格。

備註：

1. 報告中所描述之測試結果和待測設備的架構組合，均根據實際量測情況作詳實的記錄，且本測試報告僅對上述待測設備樣品負責。
2. 此份報告未經本公司同意，不得部份摘錄複製使用。
3. 基座系列申請，主型號: VM3D 與系列型號: VM1D，主要差異在於(1)設備外觀 (2)電路設計 (3)使用元件、線材、模組、材料 (4)使用元件位置、走線、結構不同，該產品確認符合系列產品，技術規格及射頻性能相同，詳見系列差異說明書。

測試人員：

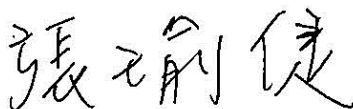


呂建伸 / 工程師

日期：

08/26/2019

報告製作：



張瑜健 / 行政

日期：

08/26/2019

報告審核：



蔡永譚 / 副理

日期：

08/26/2019

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測試實驗室資料:

實驗室認可登錄 : 中華民國實驗室認證體系

認可編號 : TAF 1309, 認可頻率範圍9kHz ~ 40GHz

認證有效期間 : 105年10月18日起至108年10月17日止

測試場地 : 新北市五股區五工六路11號

實驗室名稱 : 程智科技股份有限公司
五股實驗室

實驗室地址 : 新北市五股區五工六路11號

電話 : 886-2-22999720

傳真 : 886-2-22981882

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實驗室之量測不確定度

測試項目	測試場地 / 測試頻率	不確定度(dB)
傳導干擾電壓量測	Powerline Conducted Emission	+/-1.2575
輻射干擾場強量測 (測試距離: 3m)	3M Semi Anechoic Chamber / 30MHz ~ 200MHz	+/- 4.12
	3M Semi Anechoic Chamber / 200MHz ~ 1GHz	+/- 4.68
	3M Semi Anechoic Chamber / 1GHz ~ 8GHz	+/- 5.18
	3M Semi Anechoic Chamber / 8GHz ~ 18GHz	+/- 5.47
	3M Semi Anechoic Chamber / 18GHz ~ 26GHz	+/- 3.81
	3M Semi Anechoic Chamber / 26GHz ~ 40GHz	+/- 3.87

附註: K=2 即代表測試結果具有95%的量測可信度。

符合性判定僅依據試驗結果，不考慮其試驗結果的量測不確定度

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1 一般資料

1.1 產品特性

產品名稱	資料收集電腦	
產品型號	VM1A-L0N	
產品商標	Honeywell	
基座(標準型)	Brand Name: Honeywell / Model No.: VM1D	
基座(增強型)	Brand Name: Honeywell / Model No.: VM3D	
Product HW/SW Version:	VM1AL0N / 85.00.00-0322	
Radio HW/SW Version:	V1.0 / V5.1.1.28U	
使用電源	10.8Vdc from Rechargeable Li-ion Battery or 15Vdc from AC/DC Adapter	
	Battery:	Model No.: 163176-0001 Rev C / OVT310L1R00 C Supplier: TOTEX
	Adapter:	Model: GT-46600-6015-T3 Supplier: GlobTek, Inc.

WLAN 2.4GHz:

Wi-Fi	發射頻帶	頻道數	輸出功率	Modulation Technology
11b/g	2412-2462	11	b: 25.80 dBm g: 27.65 dBm	DSSS, OFDM
11n	HT20 2412-2462	11	27.63 dBm (Main)	OFDM
11n	HT40 2422-2452	7	22.89 dBm (Main)	OFDM
調變方式:		CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM		
Transition Rate:		802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300.0Mbps		

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WLAN 5GHz:

調變	發射頻帶 (MHz)		輸出功率 (dBm)	頻道數 (Channels)
802.11 a mode		5150 ~5250	13.92	4
		5250 ~5350	20.90	4
		5470 ~5725	20.76	12
		5725 ~5850	20.94	5
802.11n HT20 / ac VHT20 mode	HT20:	5150 ~5250	13.86	4
	HT20:	5250 ~5350	20.90	4
	HT20:	5470 ~5725	20.77	11
	HT20:	5725 ~5850	21.12	5
802.11n HT40 / ac VHT40 mode	HT40:	5150 ~5250	13.60	2
	HT40:	5250 ~5350	21.09	2
	HT40:	5470 ~5725	20.89	5
	HT40:	5725 ~5850	21.12	2
802.11 ac VHT80 mode	VHT80:	5150 ~5250	13.15	1
	VHT80:	5250 ~5350	9.11	1
	VHT80:	5470 ~5725	20.15	2
	VHT80:	5725 ~5850	19.87	1
調變方式	256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM			

1.2 測試方法之依據

本測試報告之所有項目皆依據國家通訊傳播委員會低功率射頻電機技術規範(LP0002, 107.1.10版本) 如無國家標準可適用者，得依美國EIA、IEEE ANSI檢驗法檢驗，及美國FCC 47 CFR Part 2有關檢驗之規定及參考ANSI 63.10:2013、FCC CFR 47 15.249之檢驗法。

項次	測試項目	適用規範	測試結果	量測設備	備註
1	最大暴露量允許值	低功率射頻電機技術規範 5.20.2節	請參閱5.3節	請參閱4.1節	合格
	以下空白				

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2 適用規範

規範要求

依據 NCC 低功率射頻電機技術規範之 5.20.2，其發射機距離人體 20 公分以上者，需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 (MHz)	電場強度 (V/m)	磁場強度 (A/m)	功率密度 (mW/cm ²)	平均時間 (minutes)
0.3-3.0	614	1.63	*100	6
3-30	1842/f	4.89/f	*900/f ²	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：百萬赫(MHz)。

(2) 一般人/不可控制之暴露

頻率範圍 (MHz)	電場強度 (V/m)	磁場強度 (A/m)	功率密度 (mW/cm ²)	平均時間 (minutes)
0.3-3.0	614	1.63	*100	30
3-30	1842/f	4.89/f	*180/f ²	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：百萬赫(MHz)。

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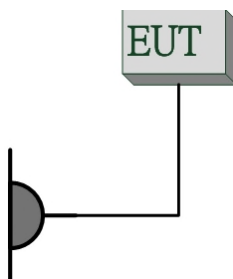
3 受測裝置之系統說明

裝置名稱	製造者/申請者	型號
*資料收集電腦	Honeywell International Inc./ 漢威聯合股份有限公司	VM1A-L0N

3.1 量測配置圖

3.1.1 量測配置圖

Conducted (Antenna Port) Emission



3.2 輔助測試週邊設備名稱描述

編號	產品別	商標	型號	序號	信號線	電源線
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A

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4 量測儀器設備

4.1 天線端傳導測試之量測儀器

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	02/13/2019	02/12/2020
DC Block	Mini-Circuits	BLK-18-S+	31129(1)	02/26/2019	02/25/2020
Attenuator	Mini-Circuit	BW-S10W2+	1	02/26/2019	02/25/2020
Power Meter	Anritsu	ML2496A	1242004	10/23/2018	10/22/2019
Power Sensor	Anritsu	MA2411B	1207365	10/23/2018	10/22/2019
Power Sensor	Anritsu	MA2411B	1207368	10/24/2018	10/23/2019

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5 最大暴露允許值 (MAXIMUM PERMISSIBLE EXPOSURE, MPE)

5.1 適用標準

依據NCC低功率射頻電機技術規範5.20.2節之要求。

5.2 適用種類

此待測物，為一般市面上販售，固適用表2) 一般人/不可控制之暴露之限制值

5.3 最大暴露允許值之評估

僅以最差模式進行評估，評估結果請見下頁。

天線種類：

2.4G WLAN

天線型式	Supplier	Model No.	發射頻帶(MHz)	天線增益(dBi)
Dipole	LAIRD	WTS2450	2412-2472	2.1
Printed	N/A	N/A	2412-2472	1.1 (Ch0) 2.7 (Ch1)
Dipole	LARSEN	R380500314	2412-2472	1.6

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5G WLAN

天線型式	Supplier	Ch0/Ch1	Model No.	發射頻帶(MHz)	天線增益(dBi)
Dipole	LARSEN	Ch0	R380500314	5150~5250	5.00
				5250~5350	5.00
				5470~5725	5.00
				5725~5850	5.00
Dipole	LARSEN	Ch1	R380500314	5150~5250	5.00
				5250~5350	5.00
				5470~5725	5.00
				5725~5850	5.00
Dipole	Laird	Ch0	WTS2450	5150~5250	2.60
				5250~5350	2.60
				5470~5725	2.60
				5725~5850	3.40
Dipole	Laird	Ch1	WTS2450	5150~5250	2.60
				5250~5350	2.60
				5470~5725	2.60
				5725~5850	3.40
Printed	N/A	Ch0	N/A	5150~5250	4.70
				5250~5350	4.60
				5470~5725	4.80
				5725~5850	4.70
Printed	N/A	Ch1	N/A	5150~5250	4.40
				5250~5350	4.70
				5470~5725	4.90
				5725~5850	3.40

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MIMO (最差模式)

802.11b_2Tx									
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Total Avg Output Power (dBm)	Limit			RESULT
			CH 0	CH 1					
1	2412	1	20.29	20.17	23.27	1 Watt =	30.00	dBm	PASS
6	2437	1	20.31	20.24	23.32	1 Watt =	30.00	dBm	PASS
11	2462	1	19.42	18.99	22.25	1 Watt =	30.00	dBm	PASS

導入之公式: page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2$$

S = 功率密度 P = 傳導功率 G = 天線增益值 R = 人體與天線之距離

MIMO 模式 gain 值計算 = $G + (10 \log N) = 2.7 + 3.01 = 5.71 \text{ dBm}$

Max. output power including tune-up tolerancel:	23.32	(dBm)
Max. output power including tune-up tolerancel:	214.7830474	(mW)
Duty cycle:	100	(%)
Maximum Pav :	214.7830474	(mW)
Peak Antenna gain (Maximum):	5.71	(dBi)
Peak Antenna gain (linear):	3.723917063	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm ²)
Power density at predication frequency at 20 (cm) distance	0.159	(mW/cm ²)

運算之結果:

當功率密度在 20 cm，其最大暴露值為 0.159 mW/cm².

註:工作頻率為頻率範圍1,500-100,000 (MHz), 固其對應之限制值為1.0mW/cm².

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MIMO (最差模式)

802.11n_HT40_MIMO

CH	Freq. (MHz)	Data Rate	AVERAGE POWER (dBm)		TOTAL POWER (dBm)	REQUIRED LIMIT (dBm)	RESULT
			CH0	CH1			
38	5190	MCS8	10.03	9.55	13.50	21.96970004	PASS
46	5230	MCS8	10.19	9.57	13.60	21.96970004	PASS
54	5270	MCS8	17.42	17.34	21.09	21.97 or 11+10log(B) = 27.97	PASS
62	5310	MCS8	11.63	11.57	15.30	21.97 or 11+10log(B) = 27.14	PASS
102	5510	MCS8	11.47	11.35	15.12	21.97 or 11+10log(B) = 27.12	PASS
110	5550	MCS8	17.24	17.12	20.89	21.97 or 11+10log(B) = 27.99	PASS
134	5670	MCS8	12.19	12.01	15.81	21.97 or 11+10log(B) = 27.16	PASS
151	5755	MCS8	17.25	17.31	20.98	27.98970004	PASS
159	5795	MCS8	17.34	17.48	21.12	27.98970004	PASS

導入之公式: page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2$$

S = 功率密度 P = 傳導功率 G = 天線增益值 R = 人體與天線之距離

MIMO 模式 gain 值計算 = G + (10 logN) = 5 + 3.01 = 8.01dBm

Max. output power including tune-up tolerance:	21.12	(dBm)
Max. output power including tune-up tolerance:	129.41958	(mW)
Duty cycle:	100	(%)
Maximum Pav :	129.41958	(mW)
Peak Antenna gain (Maximum):	8.01	(dBi)
Peak Antenna gain (linear):	6.3241185	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5795	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.163	(mW/cm ²)
運算之結果: 當功率密度在 20 cm，其最大暴露值為 0.163 mW/cm ² . 註:工作頻率為頻率範圍1,500-100,000 (MHz)，固其對應之限制值為1.0mW/cm ² .		

~ End of Report ~

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